VOL. 67. PART 5 NOVEMBER, 1948

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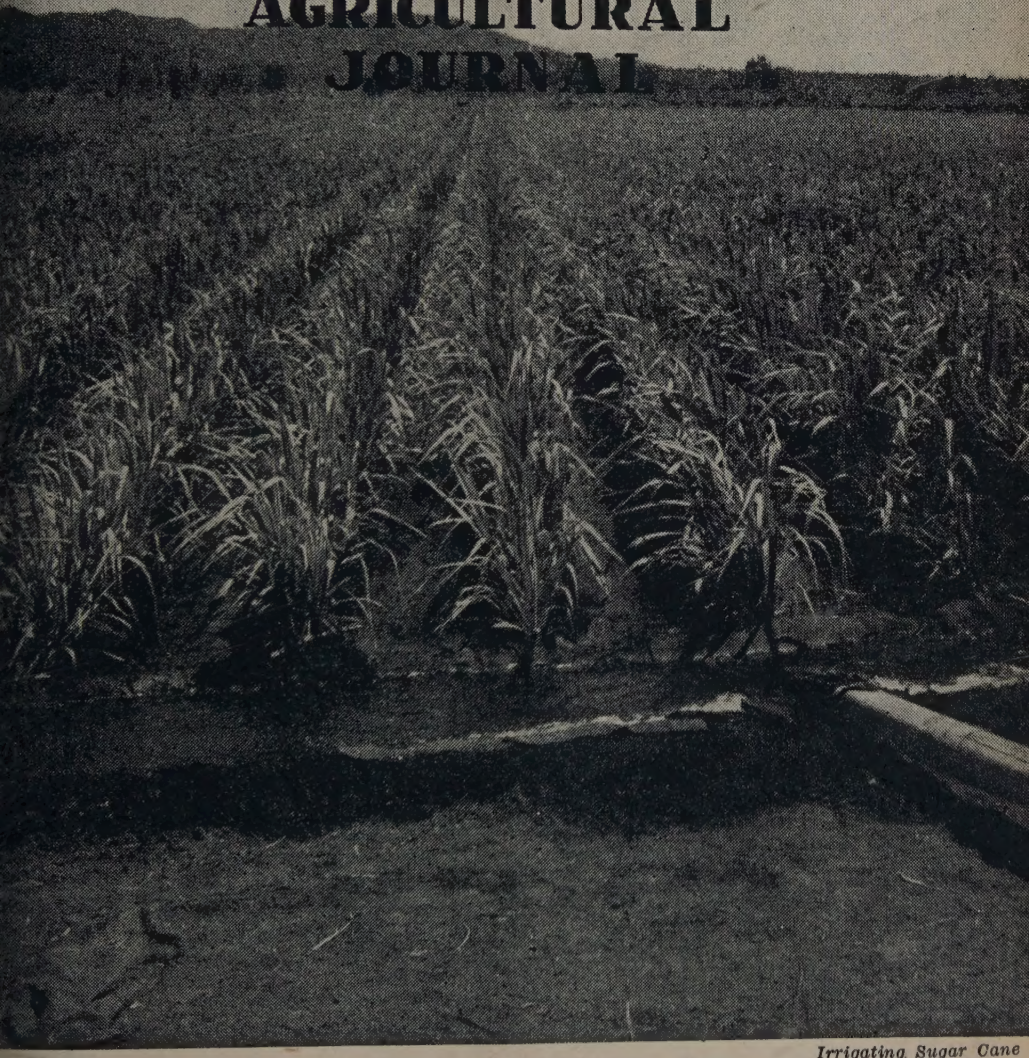

Irrigating Sugar Cane on the Burdekin.

LEADING FEATURES

Cape Gooseberry Growing
The Choko
Lumpy Wool of Sheep
Feeding the Dairy Cow
The Feeding of Pigs

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Volume 67 Part 5

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
C. W. WINDERS, B.Sc.Agr.

NOVEMBER, 1948

Issued by Direction of
THE HONOURABLE H. H. COLLINS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

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QUEENSLAND AGRICULTURAL JOURNAL

Volume 67 | 1 NOVEMBER, 1948 | Part 5

Event and Comment.

The Emphasis is on Feeding.

IN this issue appear two articles on livestock feeding which should be kept on hand by all farmers who use home-grown or bought feeds to supplement their pastures.

The feeding of stock is too often carried out in a haphazard manner, or at least without an adequate knowledge of the principles of feeding and the most economical feeding practices. It is not sufficient to know that proteins, carbohydrates, fats, minerals and vitamins are essential to animal health and production. The feeder must also understand the requirements of the various classes of stock which he is feeding, have a working knowledge of the composition of the common feedstuffs, and be able to calculate the cheapest "buy" that meets his needs.

Slapdash methods of supplementary feeding can be very costly and wasteful. While waste is to be deplored at any time, it is inexcusable in the present circumstances, with many essential feeding stuffs in short supply. Cost of feeding also must be carefully watched, since the margin between production costs and prices of commodities such as milk, butter and pigmeats is seldom wide enough to permit unnecessary expenditure on feedstuffs.

For most efficient feeding—which means using foodstuffs to the best possible advantage and at the lowest possible cost—the farmer must be able to devise rations which will yield maximum economic returns. In the feeding articles in this issue, he will find much to guide him in drawing up a ration that is near enough to being balanced and can be fed economically.

Correspondence Course in Agricultural Science.

AT the instance of the Premier of Queensland (Hon. E. M. Hanlon, M.L.A.), the University and the Departments of Public Instruction and Agriculture and Stock have planned a correspondence course in Agricultural Science, to commence next March.

The course is designed to give training in the elementary scientific basis of agriculture and its application to agricultural practice.

Groundwork Studies.

As some knowledge of chemistry and physics is essential to the proper understanding of soils and plant and animal growth, an introductory course on the principles of these subjects will be available for those requiring it. This course will consist of 30 lessons spread over a year.

The first year of the main course will be devoted to two subjects —(1) the science of animal life, and (2) the science of plant life. In the second year the science of soils and the growing of crops will be dealt with.

Specialisation.

After the first two years of the main course have been completed, the person undertaking the course can choose between livestock production and crop production for his specialisation in the final two years.

The livestock production course covers animal husbandry, stock breeds, pastures and other aspects of the subject.

Those electing to study crop production can specialise in either field crops or horticultural crops. Subjects common to both groups include plant pests and diseases.

Requirements for Certificate.

Any of the subjects can be taken individually, but to secure a Certificate 10 subjects will have to be completed. Six of these will be of 60 lessons each, and the other four of 30 lessons each.

Cost of Enrolment.

For each individual subject there will be an enrolment fee of 10 shillings, payable as the subject is commenced. Thus, for the first year of the main course the fee for the two subjects will be £1. The fee for the introductory course is 10 shillings.

Each year there will be a summer school of about a fortnight's duration at the State Agricultural College. The cost of board, excursions and entertainment at this school will be about £5.

Where to Apply.

Farmers and intending farmers interested in the course may obtain full particulars from the Supervisor, Brisbane Technical Correspondence School, Webster's Building, Mary Street, Brisbane.

Aus.12 (67 no.5).

MAP SHOWING THE LOCATION OF OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK (OCTOBER, 1948)

Importation of Bees.

COMMONWEALTH quarantine legislation with respect to bees provides that only queen bees and their escorts may be imported from overseas, and such importations must comply with the following requirements:—

The queen bee and a small escort must be consigned to the Chief Quarantine Officer (Animals) of the State of importation and be accompanied by—

(*a*) A declaration by the owner stating that they are free from disease and that they are from an apiary that is free from disease, and

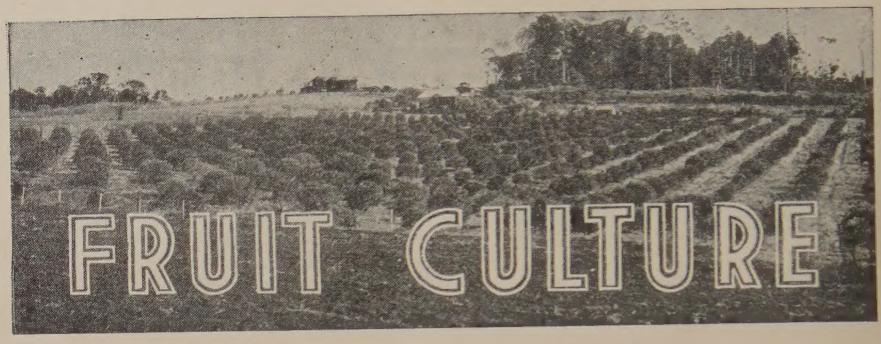
(*b*) Certification from a Government Veterinary Surgeon or other officer whose duties relate to agriculture in the exporting country, certifying that the bees are from a disease-free area and that Isle of Wight disease (acariasis) does not exist in that country or in any apiary within 20 miles of that in which the bees are kept.

If, on arrival, she and her escort are found healthy, the queen is placed in a new cage with a fresh escort and suitable food and a permit is issued for her release. If, on the other hand, the bees are found to be diseased, they are destroyed.

In 1943, it was found that certain Tasmanian apiaries were infected with *Braula coeca* and for this reason special quarantine conditions were imposed on bee exports from Tasmania to the mainland. These include certification of freedom from disease by a Government Veterinary Surgeon or Apiary Inspector.

The importation of used or second-hand bee hives from overseas is totally prohibited.

These precautions are taken to protect the Australian bee industry against the introduction into this country of *Braula coeca* infestation, acariasis and nosema disease, which are proclaimed diseases under the Quarantine Act, and any other diseases which may endanger the welfare of the beekeeping industry.



Cape Gooseberry Growing.

K. M. WARD, Horticulturist, Horticulture Branch.

THE cape gooseberry* is a native of Peru and belongs to the family *Solanaceae* in which are included the tomato, the potato and tobacco. The family is, of course, quite distinct from the one of which the English gooseberry is a member.

In Queensland, two types of cape gooseberry are grown, the more common being the small-fruited, yellow variety, the berries of which measure half-an-inch or a little more in diameter, while the other is the Golden Nugget variety (probably the variety *edulis*), which bears slightly larger fruit. The small berries of the former are usually preferred because of their superior flavour, but both varieties make good jams and preserves.

The plant itself is a non-woody shrub, commonly growing to a height of 3 ft. and having a spread of 5 to 6 ft. It is characterised by its habit of bearing fruit enclosed in an inflated calyx, the "husk." Though the plant is a perennial, it is in common practice almost invariably cultivated as an annual in this State. Under south-eastern Queensland conditions it will grow vigorously in spring, summer and autumn, producing its main crop between May and September.

Climatic and Soil Requirements.

Growing conditions and cultural practices required by the cape gooseberry are in many respects similar to those suitable for tomato culture in coastal districts. The plant is favoured by a warm spring and summer climate with abundant rain, but relatively dry weather is desirable during the maturing and harvesting of the crop. Severe frosts may kill most of the aboveground portion of the plant.

The most suitable soils are sandy loams and loams, but, provided there is free movement of water through them, the plant makes good growth on a rather wide range of soil types.

Propagation.

The plant is propagated from seeds, and the raising of cape gooseberry seedlings is carried out in much the same way as the raising of tomato plants. Germination, however, is inclined to be slow and irregular, and the percentage of seeds which eventually germinate is

* *Physalis peruviana* L.

normally rather low; hence, an ounce of seed is usually required to provide sufficient plants for an acre. Seed-beds can often be successfully established by squashing the fresh fruit and scattering the seed in the soil.

Plants are raised in well prepared seed-beds in which the seed is covered by a shallow layer of soil containing a good percentage of dried horse manure to prevent caking of the surface. The seed-bed should be kept moist, but shading is not usually necessary. As the seedlings grow they should be either thinned or pricked out into nursery beds in which the rows are 3–6 inches apart and the plants 2–4 inches apart. Eight weeks or more after sowing the seedlings should be ready for transplanting in the field, but they should first be hardened off by gradually reducing the water supply. Just prior to lifting they should be well watered to soften the soil.

Planting Out.

Planting out in the field should, of course, be preceded by suitable soil preparation, including the supplying of organic matter in the form of a green crop, and appropriate cultivation. Planting distances range from 5 ft. x 5 ft. (1,740 plants per acre) to 8 ft. x 8 ft. (680 plants per acre) and 8 ft. x 10 ft. (544 plants per acre) according to the fertility of the soil and the method of cultivation. If horse- or tractor-drawn implements are to be used in the early stages of plant growth, the widest spacing is most suitable. The plants are set out in late summer or early autumn, early planting being regarded with disfavour in some localities because such a practice renders the crop more liable to attack by corn ear worm. The cape gooseberry has a large proportion of its feeding roots near the surface of the ground, and as these roots spread across the rows cultivation with implements must be correspondingly reduced. Light cultivation with hand tools should suffice for weed control during the later stages of growth.

Fertilizing.

A basal application can be made by opening a furrow along the row to be planted and then spreading, over a distance of about 2 feet, 4 oz. of a mixed fertilizer at each point where a seedling is to be planted. After turning another furrow, a plant can be set at each position where the fertilizer has been placed. A basal dressing can also be applied by opening a hole with a hoe or some other suitable tool, spreading and mixing the fertilizer in it and then planting. Some growers apply fertilizer by topdressing soon after the plants become established and chipping the mixture into the soil with a hoe.

Suitable mixtures for use in this application are those containing 5–8 per cent. nitrogen, 10–15 per cent. phosphoric acid and 5–6 per cent. potash.

Topdressing with sulphate of ammonia or with the above mixtures, when the plants are about half-grown, is practised at times with beneficial results.

Harvesting and Marketing.

The crop will begin to mature approximately three months after planting out and harvesting may extend over a period of a further 2 to 3 months. Maturity of the berries is indicated by the changing of the husk colour from green to pale brown, and at this stage the fruit commences to fall from the bush. It is considered preferable to gather

the fruit from the ground rather than to pick it from the plant, as this ensures a maximum degree of uniformity in its colour and maturity. The gathering should be done at regular intervals, and in the course of this work it is well to jar or shake each plant so that all mature fruit will fall to the ground.

If necessary, the berries should be spread out in thin layers for a day or two to enable them to dry out. Preparation for market includes the dehusking of the fruit and placing it in suitable containers. Two-pound boxes are preferable if the fruit is to be forwarded to the fresh fruit market; and 12-pound boxes or half-bushel cases (holding about 26 lb.) if it is to be sent to the factory. The principal marketing period in southern Queensland is from June to September.

Yields and Bearing Period.

Under good cultural and general growing conditions, this crop can be expected to yield 3,000 lb. of fruit per acre, but heavier yields are obtained from time to time.

After the plants have borne one crop they are usually disposed of, but, in the absence of any diseases which are injurious to their roots or crowns, they can be pruned back to within six inches of the crown. Subsequent new growth will normally bear good crops of fruit.

Pests and Diseases.

The most important pests of cape gooseberries are cutworms, corn ear worm, red spider and tomato mite. Cutworms may prevent the establishment of the young plants by cutting them at ground level. To prevent this, 0·1 per cent. DDT may be sprayed on the ground or poison bran bait scattered over the area. The corn ear worm, a common pest also in tomatoes, may burrow into the young fruit and much of the crop may be lost. DDT sprays or dusts should be applied as required for this insect. Both red spider and the tomato mite may cause serious damage to the foliage. The former may infest the whole plant, with a preference for the young growth, while the tomato mite causes defoliation from the base upwards. This may be prevented by the regular use of sulphur either as wettable sulphur or lime-sulphur sprays, or as dusting sulphur. Further information on these pests may be obtained from the Entomological Section of the Department.

Plant disease, as distinct from insect injury, is seldom sufficiently serious in cape gooseberries to cause any concern. A leaf spot has been recorded but this is not of any economic importance. A virus disease, the same as that causing big bud of tomatoes, produces a tufty growth of the rosette type. Affected plants are a complete loss and if detected early in the growing season should be removed from the crop to prevent the spread of the disease.

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The Choko.

C. N. MORGAN, Senior Adviser in Horticulture, Horticulture Branch.

THE choko is a popular vegetable grown in coastal districts in Queensland for market, and it is also an excellent vegetable for the home garden in many parts of the State. It is an herbaceous perennial creeper, resembling the climbing cucumber, and given satisfactory treatment is a robust grower in the warmer months of the year. During the cold weather of July and August the plant temporarily dies back.

While in growth the plant forms under the ground a large tuberous root, and it is from this that growth starts in the spring. With good cultural treatment, regeneration will go on for many years, and therefore a grower must ensure, if he intends to grow chokos successfully, that his trellises are well constructed in order to last through the life of the plant. The plant is usually most productive in the later years; consequently, the early breaking down of a trellis represents a severe loss.

Trellising.

A strong well-constructed trellis may be made with round timber. Various types of trellises are used; the two illustrated are satisfactory. They can be made as long as desired—say two to three chains. One method of constructing the trellis (see Plates 82 and 83) is to set the posts 2 feet 6 inches in the ground with 22 feet between them at ground level and at an angle to allow 15 feet at the top. The tops of the posts are cut level, and the inner corners trimmed, allowing the vertical check of the cross piece to fit tightly against the posts. The height of the trellis is 6 feet. Twelve feet is allowed

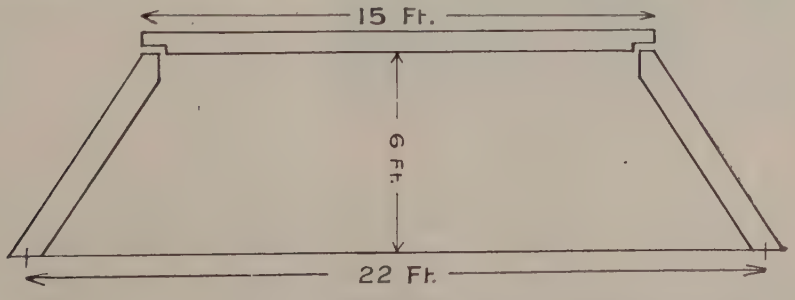

Plate 82.

SHOWING THE CONSTRUCTION OF TRELLIS DESCRIBED IN FIRST METHOD.

between posts on each side of the trellis, and the end posts should be well stayed. Wire of 12½ gauge is stretched along the trellis and attached firmly to the posts at intervals of approximately 15 inches.

Plate 83.

VINES ON TRELLIS BUILT BY FIRST METHOD, AND SHOWING IRRIGATION LINE.

In the second method (see Plate 84) two rows of strong posts are set vertically in the ground, with a height of about 6 feet, the rows being about 10 feet apart, and the posts about 9 feet apart in the rows. The tops of the posts support cross timbers on which 12½-gauge plain wire is stretched, allowing 15 inches to 18 inches between the wires. Stays support the posts, and wires are also stretched on these.

Planting.

The entire choko fruit is used for planting. Each fruit bears only one seed, which is situated in the base of the fruit. Plants are set approximately 12 feet apart along the trellis. Towards the spring, or at almost any time during the warm weather, provided the fruit has reached maturity, the seed will break into growth. When all danger of frosts is past planting may be done. It should be carried out as early as possible in order to allow the plant sufficient growing time during the warm weather to establish itself thoroughly for the succeeding season. Late planting is sometimes unavoidable; in this case no crop may be harvested the first season but the plants will be partly established for the next season.

Plate 84.

SHOWING TRELLIS BUILT TO SPECIFICATIONS OF THE SECOND METHOD.

As long as the seed has started to shoot the fruit is ready for planting, and the usual practice is to place the fruit on its side at an angle of about 45 deg., with the shoot downwards, so that the shoot is about 3 inches to 4 inches below the surface and the narrow end at ground level, or slightly exposed.

The green variety is the more popular market type, but the cream variety is sometimes favoured by home gardeners.

Plate 85.
HEALTHY WELL-SHAPED FRUIT READY FOR PLANTING.

Plate 86.
SHOWING METHOD OF PLANTING.

Cropping.

Under good growing conditions the plants establish themselves in a short time, and grow rapidly. With early planting a crop may be harvested during March and April. The following season an early crop will probably set, and will be fit for market during November and December, with the main crop again appearing in March and April. Fruit may be harvested in between the two crops, but in smaller quantities. It is this feature which makes the choko an ideal plant for the home gardener, as it is very rarely during the greater portion of the year that there are not a few fruit ready for picking. Early crops in some instances are not big, and it is necessary that the plants be plentifully supplied with both food and water when they start into growth to obtain any quantity of fruit at this stage.

Plate 87.

TWO STRONGLY-CONSTRUCTED BOWERS SUPPORTING HEALTHY VINES.—Note spread of vines between trellises.

Fertilizing and Manuring.

Although it may appear that this vegetable requires a minimum amount of attention to grow satisfactorily, this is far from true. A successfully grown choko will produce an abundance of growth and fruit, and in doing so its food requirements are particularly heavy. Farmyard manures appear to be most satisfactory, and *should be applied in the early spring prior to growth*. As the choko grows very rapidly any subsequent applications of manures are made somewhat difficult unless spread under the trellis. It is therefore recommended that a heavy application of either fertilizer or manure be made in the spring. The initial dressing may be supplemented by later topdressings of fertilizer or manure broadcast around the plants *under* the trellis. It is a common practice even with the spring dressings to place a certain

amount under the trellis. As a substitute for farmyard manure, meatworks fertilizer may be used, or a complete fertilizer containing a good proportion of meatworks manure. The fertilizer should be applied similarly to and at the same time as recommended for farmyard manure. Topdressing under the trellis and adjacent to the plants with a quick-acting fertilizer high in nitrogen is recommended where the base dressings are of meatworks manure or mixtures containing it. Two topdressings may be made during the season, but one should coincide with the time the main crop is setting during midsummer.

Eight to ten pounds of fertilizer per plant as a spring dressing when the plants are established should be sufficient, with topdressings of 2 to 3 lb. per plant.

Plate 88.

FULLY DEVELOPED MEDIUM-SIZED FRUIT READY FOR MARKET.

Irrigation.

A constant and copious supply of water is essential for good growth, and at no stage must the plants be allowed to lack moisture. Many of the bowers are planned so that a permanent irrigation line is set up under the trellis (see Plate 83). Thorough soakings are required. When the plants are in full growth and cover the trellises and the ground beneath, the dense foliage tends to lessen evaporation, so that it is not difficult to keep the soil in a moist condition.

Harvesting.

Chokos should be harvested when they are fully developed. They may vary in size according to type and growing conditions. They should not be allowed to become too old, but must be picked prior to seed development. They may be marketed loose or packed in clean corn sacks or cases. An average crop from a good healthy bower should be in the vicinity of 600-700 dozen per chain or about 60-70 dozen per plant.

PLANT PROTECTION

Control of Army Worms.

J. A. WEDDELL, Entomologist, Science Branch.

REPORTS of swarms of caterpillars have come in this spring from various parts of the Darling Downs. These caterpillars are usually called army worms because of their congregating and migrating habits. Infestations of this kind usually start in grasslands and the army worms are liable in the course of their movements to invade and damage standing crops. Usually when the army worms are on the move they form a fairly well defined "front." Even after they have entered a crop and have become somewhat dispersed the limits of the infestation can be easily found. Occasionally infestations by this type of insect are somewhat general over an area and there is no definite "front."

The standard and well tested method of control of this type of infestation consists in the scattering of a poison bran bait along the line of the front and for a strip a few feet wide in advance of it.

Preparation of Bait.

In a large tub or other suitable container, thoroughly mix 1 lb. Paris green into 25 lb. dry bran. In another smaller vessel mix 1 qt. molasses into 2 gallons water. Pour the sweetened solution on the poisoned bran and then mix the whole thoroughly to a uniformly moist loose mash. By mixing the bait in this way and to these proportions the finished material should be in a moist, crumbly condition and each flake of bran should carry its small proportion of the poison.

Distribution of Bait.

The bait should be distributed by broadcasting it as is done in the hand sowing of grain. In grassland the operator should walk along the front line of army worms and cast the bait in a wide scatter, partly over the caterpillars but mainly in advance of them. When the army worms are invading or are liable to invade standing crops particular atention should be given to the headlands. The bait can also be broadcast in the standing crop over an area including and slightly beyond the limits of infestation.

If the army worm infestation is of the less usual scattered type and not clearly defined, then the bait may need to be scattered over a fairly wide area; but particular attention should still be paid to margins so as to prevent the formation of a "front," particularly in the vicinity of crops.

DDT an Alternative.

Although as already stated the use of bran baits is the standard method of control of army worms, the newer insecticide DDT has been used against this type of pest with good results. Hence, should there be any difficulty in obtaining baiting materials, a DDT spray at a strength of 0·1 per cent. DDT may be used, or DDT dusts may be applied.

Black Aphids Invade South-eastern Queensland.

J. A. WEDDELL, Entomologist, Science Branch.

OVER a very wide area of south-eastern Queensland swarms of winged black aphids occurred this spring. At first, they were reported in only a few places but gradually they became more general and they finally infested a range of at least 50 miles north and south of Brisbane, and extended from the coastline back to the eastern Darling Downs. In fact, reports from the Darling Downs area indicated that the source of the infestation was probably still further west and that the winged aphids had been air-borne on the westerly winds.

The insect is know scientifically as *Aphis leguminosae* and as its name implies it is generally associated with legumes—that is, plants of the pea and bean family. The insect is fairly common but it is not usually outstanding in any way among the many pest aphids. A check of records of possible food plants of the insect, both here and in other parts of the world, shows that at least 60 different food plants have been listed, including many species of both weeds and cultivated plants. The list includes many that are not legumes.

During the first few days of the spring invasion the insects were seen to be present on various cultivated crops, but there was no indication that they were doing anything other than resting. It was later shown that they were feeding and breeding, particularly on beans and related plants, but also to some extent on tomatoes, cucumbers, pumpkins and other vegetable crops, to a degree sufficient to cause both damage and temporary concern.

Control Measures.

Recommended control measures for this pest are as follows:—

On crops other than tomatoes, a spray containing hexaethyl tetraphosphate (HETP) should be used. This should be carefully mixed at the strength recommended by the manufacturer, with the addition of a wetting agent. The HETP must be measured accurately and applied immediately it is mixed.

On tomatoes, HETP should not be used. In the case of this crop the only satisfactory spray is nicotine sulphate, and every endeavour should be made to obtain this material even though it is in short supply. The nicotine spray for tomatoes should be mixed at the following rate:—1 fluid ounce nicotine sulphate, 3 ounces soap, 5 gallons water.

Repeat treatments are required as occasion demands, for reinfestation of the plants occurs while the insects are prevalent.

Outline of Departmental Services.

THE Queensland Department of Agriculture and Stock is a State Department administered by the Minister for Agriculture and Stock. The Department is charged with the prosecution of a wide range of activities relating to the improvement of agriculture and stock-raising in Queensland. Funds for its general activities are voted by Parliament each year, while certain special activities are financed from trust funds provided by voluntary contributions from producers' organisations or by special levies and supported by direct vote of Parliament.

Organisation of the Department.

The Department has as its permanent head an Under Secretary, who is assisted in administration work by a technical Assistant Under Secretary co-ordinating the activities of the three "production" Divisions—Plant Industry, Animal Industry and Dairying—and a second Assistant Under Secretary who oversees the functioning of the Division of Marketing and handles general administrative matters.

Branches attached to the Central Administration are Accounts, Commercial and Despatch, Records and Information. The Information Branch is responsible for publishing the *Queensland Agricultural Journal*, the *Queensland Journal of Agricultural Science* and pamphlet material, for photographic services, for radio broadcasts, &c., and also maintains a large Central Library for the use of Departmental officers.

Division of Plant Industry.

All aspects of crop production come within the province of the Division of Plant Industry, which consists of seven Branches—Administrative and General, Agriculture, Horticulture, Regional Experiment Stations, Sugar Experiment Stations, Science and Chemical Laboratory.

Administrative and General Branch.

Apart from broad administration, this Branch includes one service of particular interest to landholders of all types—the Soil Conservation service. This general service covers conservation aspects of all forms of agriculture and horticulture. It has a staff of specialists engaged on research and advisory work. To facilitate the instruction of landholders in various methods of soil conservation, Demonstration Areas have been established in many shires. Soil conservationists are stationed at Brisbane, Toowoomba and Kingaroy and may be consulted at those centres. Farmers in other centres may find it advantageous to consult their local agricultural or horticultural officer in the first instance.

Agriculture Branch.

The Agriculture Branch, which is under the control of the Director of Agriculture, conducts field investigations into various problems of crop (other than sugar cane) and pasture production, including soils and fertilizers, methods of cultivation, varieties, irrigation, &c. A plant-breeding section undertakes the improvement, by selection and breeding, of the major field crops. The Branch conducts the Bureau of Tropical

Agriculture at South Johnstone as a testing station for tropical pasture plants and various tropical crops. It has also tobacco experiment farms at Mareeba, Ingham and Ayr.

Advisory officers in agriculture are stationed in most of the important agricultural districts. In addition to providing an advisory service for farmers, these officers co-operate with the research staff in arranging and conducting farm experiments on crops and pastures.

Horticulture Branch.

The Horticulture Branch, directed by the Director of Horticulture, has, like the Agriculture Branch, both research and advisory sections, but in addition it administers the Fruit and Vegetables Act, the Diseases in Plants Acts and the Banana Industry Protection Act.

Horticultural research work is concerned with production problems, selection and breeding work, transport and storage, and maturity standards. Special research stations are located at Nambour, Ormiston and Kamerunga and there are laboratories in Brisbane. Elsewhere, research work is conducted in private orchards and market gardens.

The field advisory staff assists in research work but is concerned primarily with advising fruit- and vegetable-growers on improved methods of production. Packing instruction is also given as a field service.

Inspectors under the various Acts are stationed in producing and unloading centres to maintain standards of fruit and vegetables offered for sale, to prevent the spread of disease and for other special purposes.

Regional Experiment Stations.

Experiment Stations operated for the benefit of all production Branches of the Department are known officially as Regional Experiment Stations. Their purpose is to investigate crop, pasture and livestock production problems in the various regions, and especially to integrate crop and livestock production. Regional stations are located at Kairi (Atherton Tableland), Ayr, Biloela (Dawson Valley) and Hermitage (Darling Downs).

Bureau of Sugar Experiment Stations.

The sugar industry is serviced by a Branch of the Division of Plant Industry with laboratories in Brisbane, experiment stations at Meringa, Ayr, Mackay and Bundaberg and field advisory officers throughout the sugar-producing districts. All aspects of cane production and sugar milling are covered by this service.

Science Branch.

While certain scientific activities are undertaken by the Agriculture, Horticulture and Regional Experiment Stations Branches themselves, others are provided by the Science Branch, which has sections of entomology, plant pathology and botany. The entomologists and plant pathologists investigate the causes and control of insect and disease troubles of crops and provide an advisory service on these matters. The botany section identifies and reports on weeds, fodders and economic plants generally and conducts research into western pastures.

The Science Branch also embraces the apiary and fauna protection services.

Chemical Laboratory.

The Chemical Laboratory provides analytical services (for example, soils, waters, insecticides, dip mixtures, &c.) for various other branches of the Department and for landowners. It investigates the chemical aspects of plant toxicity and health of crops and livestock.

Division of Animal Industry.

This Division covers all forms of livestock production (excluding bees), diseases of stock and registration of brands. It consists of six branches—Veterinary Services and Acts Administration, Animal Health Stations, Sheep and Wool, Cattle Husbandry, Pig and Poultry.

Veterinary Services and Acts Administration.

Under the Chief Inspector of Stock there are a number of Divisional Veterinary Officers who perform certain veterinary services and supervise the various veterinary officers, stock inspectors and slaughtering inspectors in their districts. The inspectional services are concerned mainly with controlling the spread of livestock pests and diseases and in ensuring a wholesome meat supply. The main concern of the veterinary officers is the reduction of diseases such as tuberculosis, brucellosis and mastitis. Ordinary surgical and medication work is not usually undertaken for farmers, this being in the province of the private practitioner.

Animal Health Stations.

The Division's Director of Research is responsible for the two Animal Health Stations—at Yeerongpilly (near Brisbane) and Oonoonba (near Townsville)—which do general diagnostic and research work on animal health problems, investigate the control of parasites and provide an immunization service against tick fever in cattle.

Sheep and Wool Branch.

Field advisory officers are stationed in the chief wool-growing and sheep-raising districts to provide information and instruction on flock and property management, breeding, feeding, lamb-raising, pest and disease control, &c. The field officers also co-operate in research investigations.

Cattle Husbandry Branch.

The Cattle Husbandry Branch is responsible for matters pertaining to cattle husbandry and production in both the beef and dairying industries. Educational activities in breeding, feeding and management of cattle are undertaken and investigational work conducted.

Pig Branch.

The Pig Branch has officers at various centres to advise growers on breeding, housing, feeding and rearing of pigs and in particular to keep them informed on the best practices to adopt in producing the requirements of the market for the time being.

Poultry Branch.

This Branch is responsible for all phases of poultry production and a staff of advisers and inspectors is continuously visiting poultry farmers to advise on correct methods of production, to blood test for pullorum disease and to assist growers in reducing losses from diseases generally.

Division of Dairying.

The principal function of the Division of Dairying is to improve the quality of dairy products and to increase the efficiency of dairy production in Queensland. The approach is through research into dairy products, herd recording, field instruction of dairy farmers on improved methods of milk production, and services to factories.

Dairy Research Branch.

This Branch has laboratories at Brisbane and Toowoomba and a sub-laboratory at the Hamilton Cold Stores.

Its research work covers quality of market milk, problems of butter texture and quality, cheese manufacture, and surveys of milking techniques and the efficiency of dairy farm practices.

Routine work on the control of quality of dairy produce has several phases. Market milk is examined at depots and in the laboratory and unsatisfactory supplies are traced back to the farms where the source of the trouble is located. Causes of inferior butter are determined by chemical and bacteriological examinations.

The Branch provides an advisory service on engineering problems and on water treatment, water disposal, farm refrigeration and farm cooling.

Field Branch.

Herd recording, or the testing of the individual cows of a herd for milk and butterfat production, is carried out by a special section of the Field Branch.

Advisers in the main districts deal with matters affecting butter and cheese quality, while Dairy Officers supplement the advisory service on farms and also carry out inspectional work under the Dairy Produce Acts, insofar as farm production is concerned.

Division of Marketing.

The Division of Marketing is concerned with the operations of the numerous commodity marketing boards and other producers' organizations operating on a non-marketing basis. The Division provides the Government representatives on the boards.

The Division provides a crop-forecasting service, issues a regular production-trends bulletin, and operates a market-price reporting service for various agricultural commodities.

Within the Division is a Standards Branch, whose concern is the drawing up of standards for various farm requirements and the policing of those standards. The service applies to fertilizers, pest destroyers, stock foods, veterinary medicines and seed for sowing. In addition, a seed-testing service is provided for farmers and merchants, and various seed production schemes are supervised. Rationing of fertilizers and other products as necessary is also controlled by the Branch.

Lumpy Wool of Sheep.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

IT has become obvious that "lumpy wool" is a fairly common disease of sheep in Queensland. It occurs in most pastoral districts, but during the past year it has been particularly prevalent in the southern part of the State, where favourable seasonal conditions have prevailed.

Lumpy wool is a condition which may affect sheep of any age and in lambs it may appear within a few days of birth.

Cause.

Lumpy wool is caused by a specific organism which inhabits the soil of sheepyards and camps. In wet seasons, when the skin is slightly scalded, the organisms enter the hair or wool follicles and set up marked inflammation with a resulting deposition of a tough, horny scab.

Symptoms.

The back and sides of sheep are most commonly affected and three definite stages of the disease can be recognised:—

(1) Initial inflammation, with thickening of the skin and some weeping.

(2) A period of crust formation, which commences within about a fortnight. The scabs, which are yellowish in colour and are roughly circular, form initially on the surface of the skin. The scabs become thickened with the addition of more material from underneath, until they are characteristically pyramidal in shape, with the base of the pyramid on the skin. The wool fibres are bound together by the scabs, which gradually become drier and horn-like in appearance, though they are more friable and tend to be flaky at the edge. Development up to this stage takes several weeks. Often there is no visible external sign that sheep are affected, but as soon as the animals are handled the scabs can be readily felt. On parting the wool, the scabs, which may be up to one inch in thickness, are seen matting the wool fibres together and adhering to the skin.

(3) The third stage of the disease includes the separation of the scabs from the skin, which occurs after they have reached certain development or when dry weather occurs. If only a small area of skin has been affected and if it is not seriously damaged the wool fibres link the scab to the skin.

Suppuration may occur under large scabs and this is accompanied by ulceration of the skin and sometimes the scab is attached only at its edges.

When lumpy wool affects lambs soon after birth the first indications include a gumminess of the whole of the back and sides. In a few days this dries and forms a tough scab-like layer which is quite firmly attached to the skin. Breaks, which have the appearance of cracks in a coat of varnish, then appear and the scabs become somewhat thicker, so that they now reach about $\frac{1}{8}$-inch or more above the level of the wool.

More recent observations have revealed that the organism which causes lumpy wool often invades the hairy parts of the face and ears. When this occurs, a low, flat, amber-brown scab develops and it may spread over quite extensive parts of the muzzle or the ears.

Treatment.

Usually only a few animals in any one flock are affected and treatment is easily carried out by shearing them on a temporary board or an old pack. The affected wool should be burnt and the sore skin dressed with a solution of bluestone containing about $\frac{1}{2}$ lb. bluestone to one gallon of water.

Distribution of Sheep in Queensland.

The Queensland Government Statistician recently released figures for livestock numbers in the various Statistical Divisions and shires of the State as at 31st March, 1948.

The figures for sheep (in each case to the nearest thousand) are as follows:—

Moreton Division	3,000
Maryborough Division	1,000
Downs Division	2,235,000
Allora	1,000
Cambooya	4,000
Chinchilla	20,000
Clifton	13,000
Glengallan	13,000
Inglewood	272,000
Jondaryan	36,000
Millmerran	102,000
Murilla	31,000
Pittsworth	26,000
Rosalie	2,000
Rosenthal	73,000
Stanthorpe	153,000
Tara	500,000
Waggamba	916,000
Wambo	76,000
Other Shires	1,000
Roma Division	2,699,000
Balonne	1,376,000
Bendemere	26,000
Booringa	409,000
Bungil	358,000
Warroo	532,000
South-western Division	2,936,000
Bulloo	150,000
Murweh	928,000
Paroo	1,011,000
Quilpie	847,000
Rockhampton Division	39,000
Central-western Division	3,803,000
Aramac	775,000
Barcaldine	346,000
Bauhinia	99,000
Belyando	102,000
Blackall	654,000
Emerald	108,000
Ilfracombe	244,000
Jericho	135,000
Longreach	843,000
Peak Downs	148,000
Tambo	349,000
Far-western Division	2,014,000
Barcoo	363,000
Boulia	380,000
Diamantina	Nil
Isisford	316,000
Winton	955,000
Peninsula, Cairns, Townsville and Mackay Divisions	2,000
North-western Division	3,011,000
Cloncurry	315,000
Flinders	1,032,000
McKinlay	920,000
Wyangarie	744,000
Other Shires	Nil

Feeding the Dairy Cow.

R. D. CHESTER, Officer in Charge, Cattle Husbandry Branch.

THOUGH Queensland is one of the leading dairying States in the Commonwealth and has a greater exportable surplus of butter than any other State, it has reached this position because of certain inherent advantages of soil fertility and climate rather than by any special effort on the part of the bulk of producers. The average production per cow in Queensland is in the vicinity of 120 lb. of butterfat per annum, or approximately one-third of a pound per day. This is the lowest for all States. It should be possible to double this production by better methods of husbandry.

On many farms there is room for vast improvement in general farm management, in breeding methods and in the feeding of dairy cattle.

It is necessary not to lose sight of the possibilities of improved breeding methods. The maximum potential milk production of any cow is fixed by factors inherited from her sire and dam. Should this potential maximum be low, good feeding cannot convert such a cow into a high producer. By the wise use of herd recording, these animals can be detected, eliminated from the herd and replaced by calves from high-producing cows served by proven bulls. It is necessary that, when purchasing a bull, the farmer should pay a little less attention to the show-ring achievements of the parents and a great deal more attention to the production of the herd from which the bull is to be drawn. However, breed improvement, though essential to real progress, is for obvious reasons a slow method of improving the overall production of herds. On the other hand, much can be accomplished in a very short time by improved feeding methods.

Wiser pasture management and controlled grazing, together with supplementary feeding with green crops, dry roughages or concentrates, are the keys to immediate improvement in dairy production.

For the farmer the economic aspect of supplementary feeding is of the utmost importance. Obviously, it is only sound to feed if the

increased annual output resulting from the use of supplementary feeds is worth more in pounds, shillings and pence than the cost of buying or producing the supplements.

Cows may respond with relatively large outputs to small amounts of supplementary feed; but the milk output may not be so great in comparison with the feed intake when the amount of supplement is increased. It is obvious, therefore, that there is a best (or "optimum") level at which to feed supplements. This level will vary, depending on the nutritive state of the pastures, the cost of supplements and the price of milk. To obtain best results each farmer must attempt to feed supplements at a level approaching this optimum. To do this, he must have a good working knowledge of the various foods and of the requirements of the cow.

Plate 89.

A Balanced Ration is Essential for Maximum Production.—These milking-test winners have the capacity to respond to good feeding.

THE COMPOSITION OF FOODS.

All stock foods are made up of dry matter and water. The percentage of water in any fodder has an important effect on its physical structure and may alter the palatability. If a fodder is excessively succulent (that is, contains a large excess of water), it may be physically impossible for the animal to consume enough for normal requirements. On the other hand, insufficient succulence, particularly in hays, may lead to a dusty condition whereby much valuable food material is unavailable to the animal.

Cattle on fodders containing a high percentage of water will obviously require less drinking water than those on dry food.

In estimating the bulk of food required by a beast, only the dry-matter content of the particular fodders is taken into consideration.

The dry matter in the food is composed of a number of constituents of chemically distinct make-up. The chief of these are carbohydrates, fats, fibre, protein, minerals and vitamins.

Each chemical group has its special part to play in the overall nutrition of the animal. Absence or deficiency of any one group is likely to affect the utilization of others.

Carbohydrates and Fats.

Carbohydrates and fats form the bulk of the food. They are the energy-producing constituents, supplying (1) energy for movement, (2) heat to maintain normal body temperature, and (3) the body fats, which are used, in part, to cushion the effect of external stimuli on more delicate tissues or organs and more particularly as a store of energy to be drawn on in periods of low food intake.

Fats and carbohydrates in the diet are responsible for the formation of butterfat and milk sugar (lactose) in the milk of dairy cows.

Fats, on a pound-for-pound basis, are about twice as rich in energy as are the carbohydrates. This accounts for the high energy value of foodstuffs, such as the oilmeals, which contain relatively high proportions of fat.

Carbohydrates and fats cannot be converted into protein by the animal body. They cannot, therefore, replace protein in the diet.

Although the main function of fat in animal nutrition is that of an energy food, it has been shown that fat cannot be wholly replaced by carbohydrate in the diet. If the quantity of total fat in the ration is reduced below a certain minimum, the milk yield will fall even though the energy requirements of the animal are met. It is interesting to note that American work indicates that a low-fat diet reduces milk yield without affecting fat percentage in the milk. The workers concerned suggest that the diet should contain more than 70 per cent. of the total fat secreted in the milk. The ration should contain at least 4 per cent. of fat.

Fibre.

This is the coarse, indigestible portion of the plant which is responsible for its shape and rigidity. Plants normally develop a higher fibre content with increasing age. For instance, young green oats is low in fibre (4 per cent.), whereas oaten straw contains a high proportion of fibre (35 per cent.).

Generally fibre is not utilized to any extent by the animal, but in the case of cattle and other ruminants some fibre is broken down by bacterial action in the rumen or paunch and thereby fibre does play some part in supplying the energy requirements of the beast.

Fibre has the important function of adding bulk to the food. It fills the stomach and intestines, thus assisting normal physiological activity and facilitating better action of the digestive juices and more efficient absorption and elimination of food material and waste products. It is also necessary to stimulate normal rumination. Feeds of low fibre content frequently cause cessation of rumination with resultant bloat and impaction.

Protein.

Proteins are complex chemical groups made up by a combination of varying numbers of substances called amino acids. The particular amino acids concerned in the formation of various proteins are of importance since, in most animals, they cannot be manufactured within the body. As they are essential to the well-being of the body, it is important that proteins which contain them should be supplied in the feed. Thus proteins which contain a number of different amino acids are frequently said to be of high biological value while those proteins containing few different amino acids are of low biological value.

Plate 90.

LUCERNE HAY IS A HIGH-PROTEIN ROUGHAGE.—The only concentrate required to balance a ration of lucerne is grain containing 10 per cent. protein. The hay bales shown in this picture are being used as the wall of a silo.

However, the biological value of proteins is of less importance in the nutrition of ruminants than in the case of other animals, as the bacterial action of the rumen does account for the synthesis or manufacture of at least some amino acids. Thus, when feeding dairy cows, it is not necessary to include animal protein. There is an indication, however, that calves reared on a minimum amount of milk thrive better if some animal protein such as meatmeal, blood meal or dried milk is included in the calf's diet, since the rumen of a calf is not sufficiently developed to be capable of the same amino-acid production as that of a mature beast.

Proteins are essentially body building materials. They are responsible for the growth of muscle and the production of milk. Milking cows and growing stock require a relatively high proportion of protein

in the ration. Mature store stock and fattening cattle will thrive on diets lower in protein. Under Queensland conditions, the deficiency of protein in natural pastures is most frequently the limiting factor to milk production, and this low protein intake, more than any other single factor, is probably responsible for Queensland having the lowest average production of any State in the Commonwealth. If it were possible to supply adequate protein, the State production might well be doubled.

When protein is present in excess in the diet, the animal is capable of using the protein for the production of energy. It is wasteful and economically unsound, however, to feed excess of purchased protein concentrates.

Plate 91.

CEREAL HAY IS A LOW-PROTEIN ROUGHAGE.—A concentrate mixture of grains and protein-rich meal, with a total protein content of 20 per cent., is required to balance a ration of cereal roughage.

Minerals.

Minerals are essential for normal growth and development—that is, for the formation of bone, blood and other body tissues. There is quite a long list of minerals essential to the well-being of the animal, but in Queensland, phosphates, lime and salt are the only ones of general importance. Of these, the deficiency of phosphates causes the greatest economic loss. Many of the soils in the dairying areas of the State are deficient in phosphates, with the result that pastures are also deficient. In many districts, because of the chemical nature of the soil, pastures do not respond to top-dressing with superphosphate, and it is therefore necessary to feed licks of bone-flour.

Salt and lime deficiencies are not likely to occur under grazing conditions except in times of drought. Where cattle are heavily stall-fed, however, it will frequently be necessary to add supplements of salt and finely ground limestone.

Vitamins.

Cattle are less likely to be affected by vitamin deficiency than most other animals, since the ruminant can manufacture many of the vitamins in the rumen.

Vitamin A, however, is essential to the well-being of cattle. It is of particular importance to the growing calf and lack of this vitamin is probably, at least partly, responsible for a great deal of the loss due to scours and pneumonia of calves in this State.

Adult cattle can store a good deal of vitamin A to carry them over dry periods, and provided a reasonable amount of green feed is available to cattle from time to time during the year there is little fear that they will suffer from deficiency during relatively short periods of scarcity.

Plate 92.

MODERN ENSILING MACHINERY MAKES IT POSSIBLE TO CONSERVE A CROP WITH THE MAXIMUM DEGREE OF SAFETY AND A MINIMUM EXPENDITURE OF LABOUR.—Silage may replace hay in the ration at the rate of three pounds of silage to one pound of hay.

CLASSIFICATION OF FODDERS.

Fodders are usually classified according to the amount of fibre they contain and again according to their percentage of digestible protein.

The first broad classification is into roughages and concentrates.

Roughages are those foods, such as silage, hay and mature pastures, which contain a relatively low percentage of energy food.

Concentrates are those foods, such as grains and the various meals and young actively-growing pastures and crops, which have high starch-equivalent values.

The capacity of various animal foodstuffs to fatten cattle was first assessed by Kellner, a German animal nutritionist. In order to have some unit with which all feeds could be compared, he took starch and related all other feeds back to this unit. For instance, if he found that it took 100 lb. of wheat to produce the same liveweight gain in a bullock as was produced by 72 lb. of starch, he gave wheat a starch-equivalent value of 72, and so on with other foodstuffs. Since the time of Kellner, many other workers have continued checking his figures and working out starch-equivalent values for other foods and today tables are available showing the starch equivalents of most cattle fodders.

There is no sharp dividing line between the roughages and concentrates. In intermediate positions, between the two extremes, there are such important fodders as mill offals and well balanced feeds such as green crops and pasture. However, when estimating rations it is convenient to consider most fodders as either roughages or concentrates, and perhaps the simplest method of rationing is to adjust the type of concentrate fed according to the cheapest source of roughage available.

Both roughages and concentrates, in their turn, can be divided into protein-rich and non-protein-rich groups. This is a convenient grouping for rationing purposes in that protein-rich roughage can be balanced with non-protein-rich concentrates, and so on; so that, provided this simple classification is committed to memory, it is possible to make a reasonable attempt at balancing a ration without resource to involved calculations.

TABLE 1.

FODDER VALUES OF COMMONLY USED ROUGHAGES.

	Moisture Content.	Food Units. (Starch Equivalent).	Digestible Crude Protein.
	Per cent.	Per 100 Lb.	Per 100 Lb.
Green Feeds.			
Lucerne	80	12	4·0
Cowpeas	80	12	3·0
Cereal Crops	85	14	1·5
Sudan Grass	80	12	1·5
Millet	80	14	1·3
Maize	80	12	1·0
Saccaline Sorghum	80	12	1·0
Cow Cane	75	14	0·8
Pumpkin	85	12	1·0
Silage.			
Cowpeas	80	12	2·0
Sorghum	75	12	1·0
Maize	75	12	1·0
Hay.			
Lucerne	10	35	12·0
Cowpeas	10	35	10·0
Cereal	8	35	2·0

In Tables 1 and 2 the commonly used dairy fodders have been set out in their various groups and average starch-equivalent values and digestible crude protein contents listed.

These approximate values have been given in order that they may be committed to memory, and for purposes of most feeding calculations they will prove sufficiently accurate. However, for detailed work accurately compiled tables should be consulted. The most convenient tables for general purposes are those in Bulletin 124 of the Ministry for Agriculture and Fisheries of Great Britain entitled "The Composition and Nutritive Value of Feeding Stuffs."

Plate 93.

PASTURE IS THE CHEAPEST FORM OF FOOD FOR DAIRY COWS.—Full use should be made of any available pastures. Pastures are of greatest value while growing actively. Ensure even grazing by the use of small paddocks and rotation of stock.

TABLE 2.

FODDER VALUES OF COMMONLY USED CONCENTRATES.

	Food Units (Starch Equivalent).	Digestible Crude Protein.
	Per 100 Lb.	Per 100 Lb.
Protein-rich Concentrates.		
Blood Meal	60–70	65–70
Meatmeal	75–80	53–55
Peanut Meal	75–80	40–45
Cottonseed Meal	65–70	30–35
Linseed Meal	68–72	25
Maize Gluten Feed	70–75	20
Carbohydrate-rich Concentrates.		
Maize grain	77	8
Wheat grain	72	8
Oat grain	61	8
Sorghum grain	76	7
Bran	56	10
Pollard	66	10
Molasses	50	0

Plate 94.

GREEN OATS IS WELL-BALANCED FEED FOR DAIRY COWS.—It is wise to feed a little roughage either as dry pasture or hay to cows on green oats.

THE FOOD REQUIREMENTS OF THE COW.

In order to assess a balanced ration for any individual cow, the following information is required:—

1. Liveweight of the cow.
2. Pounds of milk produced per day.
3. Butterfat content of the milk.

The liveweight of the cow determines her capacity for daily food intake.

It is convenient to estimate that a cow of 1,000 lb. liveweight will eat approximately 30 lb. of dry matter per day. For every 100 lb. above or below 1,000 lb. liveweight, add or subtract 2 lb. of dry matter from the ration.

TABLE 3.

Liveweight of Cow.	Dry Matter Required per Day.
Lb.	Lb.
700	24
800	26
900	28
1,000	30
1,100	32
1,200	34
1,300	36

There will be some variation from this table. Dry cows and beef cattle will probably eat somewhat less in proportion to their weight. Heavy milkers will frequently eat more than the average cow.

The nature of the ration, too, will have an effect upon the amount of food a cow will eat. On a heavy unpalatable ration, the appetite is reduced. On a highly palatable ration, containing a variety of foodstuffs, the cow will eat a greater bulk of feed.

However, the figures given are sufficiently accurate for the practical purpose of rationing a herd.

The liveweight also determines the starch equivalent and digestible protein required to maintain the body at normal weight.

In practice, the usual trend with a good milk producer is to lose weight for the first two to three months after calving, even when fed for her full milking capacity. After the first few months, she will gradually build up again in preparation for the next lactation period.

It is sufficiently accurate to estimate the maintenance requirements of a 1,000-lb. cow at 6 lb. starch equivalent and 0·6 lb. digestible protein and to add or subtract 0·5 lb. starch equivalent and 0·05 lb. digestible protein for every 125 lb. increase or decrease in the liveweight of the cow.

TABLE 4.

MAINTENANCE REQUIREMENTS.

Liveweight of Cow. Lb.	Food Units (Lb. Starch Equivalent.)	Lb. Digestible Protein.
750	5·00	0·50
875	5·50	0·55
1,000	6·00	0·60
1,125	6·50	0·65
1,250	7·00	0·70

The maintenance requirements will vary fairly widely according to the nature of the country on which cattle are held and according to the availability of fodder.

Table 4 gives maintenance requirements for cattle stall-fed or on adequate pasture. Maintenance requirement will increase if cattle are pastured on rough country, if they have to walk long distances to water, or if grazing is scarce and they have to graze over large areas in order to obtain sufficient nutrients. Therefore, in estimating rations it may frequently be necessary to add one or, at times, even 2 lb. of starch equivalent for maintenance purposes.

The milk yield and composition of the milk will naturally have a marked effect on the requirement of the animal. The higher the fat content of the milk, the greater its energy content; therefore, milk with a high fat content will require more food per gallon for its production than will milk of low fat content.

TABLE 5.

NUTRIENT REQUIREMENTS PER GALLON OF MILK.

Butterfat Percentage of Milk.	Food Units. (Lb. Starch Equivalent).	Lb. Digestible Protein.
	Per Gallon.	Per Gallon.
3·0	2·2	0·55
3·5	2·45	0·61
4·0	2·7	0·67
4·5	2·95	0·74
5·0	3·2	0·80
5·5	3·45	0·86

Taking 4 per cent. milk as the standard, each increase or decrease of 1 per cent. in the butterfat content of the milk entails an increase or decrease of 0·5 lb. starch equivalent in the ration necessary to produce one gallon of milk.

The digestible protein requirements for milk production are equivalent to 25 per cent. of the starch-equivalent figure.

Table 6 gives the popular dairy breeds kept in Queensland, setting out their average liveweight when mature, and the average butterfat content of their milk, together with the requirements in food units (starch equivalent) and pounds of protein for maintenance and separately for the production of each gallon of milk of average fat content.

By committing the few figures contained in this table to memory, it is possible to roughly assess the food requirements of a herd of any given breed. It must be borne in mind, however, that these figures apply only to average conditions, and for particular purposes it may be necessary to use more detailed and accurate information.

Plate 95.

GRAINS ARE A GOOD SOURCE OF CONCENTRATE ENERGY.—They are relatively low in protein and must be fed either with a legume roughage as supplement to actively growing pasture or the concentrate mixture should include some protein meal.

TABLE 6.

Breed.	Average Liveweight.	Average Butterfat Content.	Requirement for Maintenance.		Requirement for Each Gallon of Milk.	
			Food Units. (Lb. S.E.)	Lb. Protein.	Food Units. (Lb. S.E.)	Lb. Protein.
Australian Illawarra Shorthorn	1,000–1,100	4·0	6·2	0·63	2·7	0·67
Jersey	800–900	5·4	5·3	0·52	3·3	0·81
Ayrshire	1,000	4·2	6·0	0·60	2·8	0·68
Friesian	1,200	3·5	6·8	0·70	2·5	0·61
Guernsey	900–1,000	5·0	6·0	0·60	3·2	0·80

MINERAL REQUIREMENTS.

As pointed out previously, the important minerals from the point of view of the nutrition of dairy cows in Queensland are calcium and phosphorus and, to a lesser extent, salt.

The requirements of calcium and phosphorus are closely related as they are utilized in much the same way in bone formation and milk production.

Under grazing conditions there is little likelihood of a calcium deficiency; but cattle will frequently suffer from phosphorus deficiency which will manifest itself fairly rapidly when pastures become depleted.

Plate 96.

HOPPERS CONTAINING MEALS READY TO BE MIXED INTO FEEDING MIXTURES FOR STOCK.

Indications of phosphorus deficiency are loss of appetite, with an abnormal craving and the chewing of bones, wood, tins and carrion. Milk yield is reduced and cows are frequently difficult to get in calf. The beast loses condition, the coat becames harsh and rough in appearance and the gait becomes stilted and stiff. Bone structure is softened and bones break easily.

Rations of dry pasture or hay are deficient in phosphates. Grains and meals usually contain adequate phosphorus. In deficient areas cattle maintained chiefly on pasture require a supplement of bone-flour. This can be fed as a lick or in a small quantity of concentrate in the bail. Cows obtaining large amounts of concentrate, such as grains and meals, as supplements to grazing will receive sufficient phosphorus in these rations.

American workers estimate the phosphorus requirements at from 0·25 to 0·30 per cent. of the dry matter in the ration—that is, 1 part to 400 or 330.

The calcium requirements of the dairy cow have been estimated to be at least 0·25 per cent. of the dry matter in the ration—that is, 1 part to 400.

Generally pastures contain sufficient calcium for normal maintenance, as do most of the commonly used roughages; but grains, bran, and some of the meals are quite low in lime, and cows on concentrate feeds and not receiving legume roughage should receive 2 per cent. of ground limestone in the concentrate ration.

Salt is unlikely to be deficient in pasture-fed stock, but cattle being heavily stall-fed should receive 1 per cent. of salt in the concentrate ration.

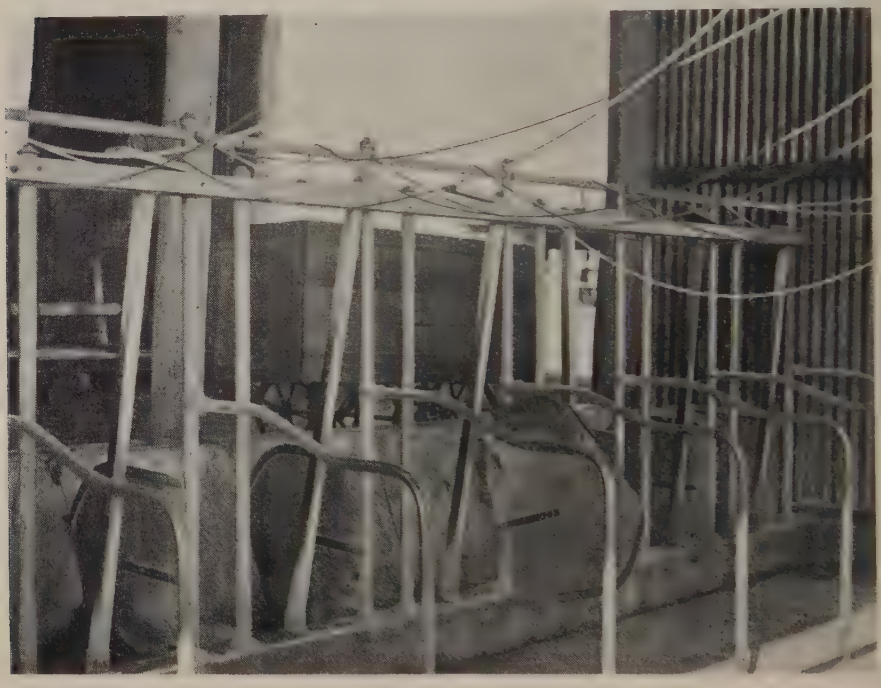

Plate 97.

PROTEIN-RICH MEALS MAY BE FED IN THE BAILS.—They are only necessary to balance the ration when pastures are mature or when quantities of non-legume roughage are to be used. Avoid drawing unduly on the small stocks of these meals by producing some legume roughage on the farm.

VITAMIN REQUIREMENTS.

The only vitamin of importance in compounding dairy cattle rations is vitamin A.

This vitamin is supplied in excess by young green pastures, and as the cow has the capacity to store vitamin A relatively long periods of low intake can be bridged by the material stored when it was available.

Deficiency in vitamin A can cause abortions, and in severe cases cows may prove difficult to get in calf.

During periods when pastures are mature or likely to be low in vitamin A, the animal can be supplied with the vitamin by feeding on good-quality lucerne hay or other legume.

Plate 98.

ADEQUATE FRESH WATER SUPPLIES AVOID WASTE OF FOOD MATERIAL WHICH RESULTS FROM MILKING COWS WALKING LONG DISTANCES TO WATER.

PREPARATION OF THE RATION.

Given the liveweight of the cow, her daily milk production and the butterfat content of the milk, together with the fodders available, it is then a matter of simple estimation to work out the daily ration which should be fed to maintain body weight and constant milk flow.

The following is an example of the method to be adopted:—

An A.I.S. cow weighing 1,000 lb. is producing 3 gallons of 4 per cent. milk per day and is to be fed on a mixture of lucerne and oaten hay with bran, meatmeal and crushed maize.

For maintenance the cow requires 6 food units and 0·6 lb. protein (Table 4).

For each gallon of milk she requires 2·7 food units and 0·67 lb. digestible protein (Table 5). Thus, for the production of 3 gallons of milk she requires 8·1 food units and 2 lb. protein.

Plate 99.

Shade and Shelter from Inclement Climatic Conditions Ensures More Efficient Conversion of Food to Milk.

Total Food Requirement.

	Food Units.	Protein.
		Lb.
For maintenance	6·0	0·6
For production	8·1	2·0
	14·1	2·6

The cow will consume approximately 30 lb. dry matter per day (Table 3).

On a diet of lucerne hay 50 per cent. and oaten hay 50 per cent., the cow would receive a total of 10 food units and 2.1 lb. protein, calculated as follows:—

15 lb. lucerne hay	5 food units	1.8 lb. protein
15 lb. oaten hay	5 food units	.3 lb. protein

This ration is adequate in bulk but deficient in both food units and protein. It requires the replacement of some roughage by concentrate feed.

Thus, if we allow the roughage to cover approximately the maintenance requirements only—

10 lb. lucerne hay	3.5 food units	1.2 lb. protein
10 lb. oaten hay	3.5 food units	.2 lb. protein
	7 food units	1.4 lb. protein

This leaves 7.1 food units and 1.2 lb. of protein to be supplied by 10 lb. of concentrate.

Since 10 lb. of maize contains 7·7 food units and 0·8 lb. protein, maize alone is too high in energy and too low in protein to balance the ration.

Substituting 4 lb. of meatmeal for 4 lb. of maize we get—

6 lb. maizemeal	4·6 food units	·48 lb. protein
4 lb. meatmeal	3·1 food units	2·16 lb. protien
	7·7 food units	2·64 lb. protein

This contains both too much energy and too much protein.

Substituting 3 lb. of bran for 3 lb. of meatmeal, we get –

6 lb. maizemeal	4·6 food units	0·48 lb. protein
3 lb. bran	1·7 food units	0·30 lb. protein
1 lb. meatmeal	0·77 food units	0·54 lb. protein
Approx.	7·1 food units	1·3 lb. protein

This approaches very closely the requirement of the ration.

The complete ration would then be—

10 lb. oaten hay	3.5 food units	1·2 lb. protein
10 lb. lucerne hay	3·5 food units	0·2 lb. protein
6 lb. maizemeal	4·6 food units	0·48 lb. protein
3 lb. bran	1·7 food units	0·3 lb. protein
1 lb. meatmeal	0·77 food units	0·54 lb. protein
30 lb. ration	14·07 food units	2·72 lb. protein

Provided good quality lucerne hay has been used this ration will contain adequate vitamin A.

It will also contain sufficient phosphorus and calcium.

Bushel Weights.

	Lb. per bushel.		Lb. per bushel.
Barley	50	Peas	60
Beans	60	Pollard	20
Bran	20	Prairie Grass	20
Cowpeas	60	Rhodes Grass	20
Grass Seeds	20	Rye Corn	60
Lupins	60	Rye Grasses	20
Maize	56	Setaria	60
Mangolds	20	Sorghum	60
Meals	20	Soy Bean	60
Millets	60	Tares	60
Oats	40	Vetches	60
Paspalum	20	Wheat	60

The ton is fixed at 2,240 lb., except for bran, pollard, and flour, which are 2,000 lb. to the ton.

The Feeding of Pigs.

F. BOSTOCK, Officer in Charge, Pig Branch.

AS a factor in economical pig production the importance of correct feeding is indicated by the fact that feed represents a very large proportion of the total cost of production. The farmer who expects to make maximum profits should, therefore, realise the significance of suitable rations and proper methods of feeding.

Pigs are kept on many farms as a means of marketing the surplus grain produced and to utilize dairy by-products. The feeder should have some knowledge of the suitability of the variety of feeds available and, at the same time, realize that complete success cannot be achieved unless thought and care are given to organization, management, layout of the piggery, selection of good quality breeding stock and a high standard of sanitation.

Feeding can influence the quality of the flesh produced and fat development, but breeding also carries weight and good quality breeding stock should always be used. Prime quality pigs are only produced by proper selection of breeding stock, combined with right feeding and good sanitation.

The body development of growing pigs is continually changing, and experimental work has shown that some parts of the body develop more quickly than other parts. In the first stage, partly before birth, bone development predominates; during the second stage, muscular growth takes precedence; in the third stage the greatest tendency is to fat development. Early-maturing pigs pass through all stages more rapidly than late-maturing pigs.

Consideration of these factors indicates that, to obtain desirable development of the carcase, pigs should be well fed during the stage when muscular growth predominates, that is, up to light porker stage.

PRINCIPLES OF FEEDING.

Feeds are usually divided into two classes—concentrated feed, or concentrates; and bulky feeds, commonly called roughages.

The seed of all plants, whole or ground, and all such feeds as are produced from the by-products of commercial establishments, supply

a large amount of nutriment in small bulk, and are called concentrates. The "body" of plants, in the form of hay, straw, green feed, pastures, and root crops, gives bulky feed or roughage.

The function of bulk in a ration is more than the mere provision of nutriment; in a mechanical way it aids digestion, for the stomach has to be comfortably filled to produce contentment. The pig, however, requires less bulky feeds than other domestic animals, but it has been found that bulk or roughage, to some extent, is very valuable in the profitable production of pork. Where roughage is not supplied and the animal is fed exclusively on concentrates, derangement of digestion usually results.

Food Constituents.

From a chemical standpoint, the constituents of feed which immediately concern the pig feeder are the nitrogenous substances, the carbohydrates and fats, and the minerals. The first-named, generally termed proteins, are used chiefly for the development of flesh. The carbohydrates, embracing starches, sugar, &c., together with the fats and oils, are used for making fat and for the supply of body heat and energy. Mineral matter or ash is not only valuable in bone-forming processes, but is necessary for the normal functioning of every organ of the body.

When feed is utilized in the animal body, a certain amount of heat is generated. This heat is converted into energy, which is necessary wherever work is performed. The term "work," however, has a very wide meaning and denotes more than actual muscular effort; for, in fact, the performance of nearly every function of the body is actually some form of work, involving the expenditure of energy. It is readily apparent that the heat-producing powers of feed have a much more important function than merely the maintenance of bodily warmth.

Importance of Balancing a Ration.

A ration should, therefore, be properly balanced with proteins, fats, and carbohydrates, and should contain a sufficiency of mineral matter. It also should be suitable as to digestibility and bulk.

To balance a ration or obtain the nutritive ratio, which denotes the number of parts by weight of digestible carbohydrates and fats associated in the food with one part of digestible protein, multiply the percentage of digestible fat by 2·25 (because 1 lb. of fat is approximately as effective as 2·25 lb. of carbohydrates) and add this to the percentage of digestible carbohydrates; then divide by the percentage of digestible protein. When this ratio is more than 1 to 7·0 the ration is said to be wide, and if less than 1 to 4·0 is said to be narrow.

Suitable Nutritive Ratios.

The following nutritive ratios will be found to be suitable for the different classes of stock:—

Weaners	1 to 4·0
Stores	1 to 4·5 to 1 to 5·0
Fattening Pigs	1 to 5·0 to 1 to 5·5
Baconers	1 to 6·0 to 1 to 7·0
Sows in Milk	1 to 5·0
Stud Boars	1 to 5·0

While the nutritive ratio is undoubtedly a good means of determining whether a ration is suitable, it should only be regarded as a rough guide, for it has been found in experiments that pigs increase in weight more in accordance with the total digestible nutrients than with nutritive ratio.

Total digestible nutrients per day suitable for different classes of stock would be:—

Weaners	1·8 to 2·0 lb.
Stores	2·18 to 2·5 lb.
Fattening Pigs	2·96 to 3·4 lb.
Baconers	3·74 to 4·5 lb.
Sows in Milk	7·2 to 8·4 lb.
Stud Boars	7·2 to 8·4 lb.

The following table shows analyses of samples of various feeding stuffs. These analyses can of course vary quite a lot.

DIGESTIBLE NUTRIENTS PER 100 LB. OF VARIOUS FEEDING STUFFS.

Feed.	Crude Protein.	Carbohydrates.	Fat.	Total.
Barley	8·4	67·5	2·0	80·4
Wheat	9·2	67·5	1·5	80·1
Maize	7·0	65·5	3·5	82·4
Sorghum	8·7	66·2	2·2	79·9
Oats	9·6	49·5	4·1	68·3
Peas	19·0	55·8	0·6	76·2
Millet	8·4	63·7	2·4	77·5
Beans	18·8	51·3	0·8	71·9
Rice	6·2	69·7	1·7	73·1
Canary Seed	11·5	48·7	4·3	71·0
Pumpkins	1·1	4·5	0·5	6·7
Artichokes	1·0	14·6	0·1	15·8
Arrowroot	0·1	18·5	..	18·5
Cassava	0·6	26·4	0·2	27·4
Sweet Potatoes	0·9	24·2	0·3	25·8
Potatoes	1·1	15·8	0·1	17·1
Mangolds	0·8	6·4	0·1	7·4
Melons	0·5	3·9	0·2	4·8
Molasses	1·0	58·5	..	59·5
Separated Milk	3·6	5·1	0·2	9·1
Meatmeal	56·2	..	7·2	71·4
Blood Meal	67·0	..	1·3	71·0
Fish Meal	40·1	..	8·3	58·8
Pollard	13·4	46·2	4·3	69·3
Bran	12·5	41·6	3·0	60·9
Linseed Meal	31·7	37·9	2·8	75·9
Peanut Meal	40·3	22·5	9·2	83·5
Peanuts with shell	17·9	8·2	32·6	99·4
Soybeans	33·2	24·7	16·1	94·1
Cottonseed Meal	31·6	25·6	7·8	74·8
Green Lucerne	3·3	10·4	0·4	14·6
Sugarcane	0·4	12·3	0·6	14·1
Green Rape	2·6	10·0	0·3	13·3
Green Maize	0·8	9·9	0·3	11·4
Lucerne Hay	10·6	39·0	0·9	51·6
Oaten Chaff	2·2	34·3	1·2	39·2
Wheaten Chaff	1·1	25·7	0·6	28·2
Bracken Fern Root	7·9	54·0	0·5	62·5

Some Definitions.

Ration is the quantity of food given to one animal for 24 hours, whether given in one or more feeds.

Balanced Ration is the total quantity of food containing the various digestible nutrients in the correct proportions for a given animal for 24 hours.

Maintenance Ration is the quantity of food required by an animal for body maintenance in 24 hours.

Digestible Nutrients is that portion of the crude nutrients which can be assimilated by an animal.

Protein is the term used to denote those nitrogenous compounds used chiefly for growth, flesh development, milk production and reproduction in animals.

Carbohydrates include starches and sugars, comprise the greater part of grains, and besides being used for production of heat and energy, are the main source of fat in the carcase.

Fats can influence the type of fat produced in the carcase. Soft fats or fats of low melting point are generally to be found in grains and such crops as peanuts, soybeans and linseed; on the other hand, fats of animal origin, such as fat in meatmeal, are comparatively hard or of high melting point, and do not affect the quality of the carcase.

Fibre: For maximum growth rates and efficient use of feed, pig rations should not contain a high proportion of fibre. Therefore bulky feeds, such as chaff, hay, silage, &c., should not constitute too great a part of the ration.

Minerals are necessary for normal growth and building up of harder tissues of the body, such as bone. Insufficiency of calcium, iron and phosphorus in the ration will lead to serious trouble and setbacks in growth.

Palatability denotes that foods are pleasing to the taste of animals; it is affected not only by the actual composition and condition of the food, but by the custom of the animals which are being fed.

PREPARATION OF FEEDS.

Most feeds require little preparation for pigs. Maize may be fed shelled or on the cob; it is not materially improved by grinding. Coarsely grinding or cracking small grains, on the other hand, results in a saving of feed. The extent to which a saving can be made by this operation depends somewhat on the hardness of the grain, but primarily on the method of feeding. Because of the pig's habit of rapid eating when hand fed in groups, a large number of small hard grains escape being broken by the teeth, and pass through the body unutilized. Pigs accustomed to eating from a self-feeder eat more slowly and masticate their food more completely than do hand-fed pigs.

Soaking is a poor substitute for grinding small grains, and does not improve the value of maize or cracked grains.

Cooking reduces rather than increases the value of most foods for pigs, hotel and slaughter-house refuse, also English potatoes, being the exceptions. A slight benefit may result by feeding a warm swill in very

cold weather. Slopping or swill feeding is an old practice, but tests have not justified its use when fattening pigs, and there is very little evidence to show that it is necessary even with brood sows.

SUITABLE FEEDS.

Maize.

Of all cereals, maize is the richest, or one of the richest, in carbohydrates and fat. Maize when fed alone does not supply an efficient ration, especially for growing pigs; and when being hogged down, or fed either on the cob or shelled, it should be supplemented with some protein-rich food.

Pigs fatten well on maize; but, as it produces a softer bacon than that from pigs fed on most other grains, it should not be fed to excess in the later stages of the preparation of baconers.

Plate 100.

A Crop of Milo Dwarf Sorghum, an Excellent Grain Crop for Pigs.

Sorghum.

Grain sorghum seed has a fattening value equivalent to 80 to 85 per cent. of that of maize; when fed alone it is an insufficient ration, and should therefore be supplemented with a protein-rich feed. Because of the hardness and size of the grain, grinding may be necessary, especially for young pigs. Outstanding qualities of these grains are their drought-resistance and sureness of cropping. Pigs fatten well on grain sorghums, but unless properly balanced with protein supplements are inclined to produce bacon of inferior quality.

Barley.

Of all grains, barley is recognised as the best for fattening pigs. It produces pork and bacon of the finest quality, and, particularly, the fat produced is hard, white, and free from greasiness. Barley may be fed alone or with other grains.

Wheat.

Wheat may be fed alone or with other grains. It is an excellent feed for pigs, yielding firm flesh and a satisfactory fat, and possessing a nutritive value equal to barley, while from a protein point of view it is superior to barley. One disadvantage is that if finely ground it is inclined to become doughy when moistened, and for this reason should only be cracked.

Oats.

Oats are not ordinarily used as pig food because of the large percentage of husk, and when fed to young pigs they sometimes develop scouring. Oats produce a good quality pork or bacon.

Peas.

Peas are rich in protein and are, therefore, useful in balancing such grains as have a high carbohydrate content. Fed alone, they produce a very hard, lean flesh, and young pigs do not thrive on them. Good results are obtained when peas are mixed with other grains, but they should not constitute more than 25 to 30 per cent. of the ration.

Millet.

If fed alone, millet will produce pork or bacon of inferior quality and inclined to be soft. For best results, millet should be mixed with other grains and should never exceed more than 30 to 35 per cent. of the ration.

Beans.

Beans also produce pork or bacon of inferior quality when fed alone, but can be profitably used with other grains, although they should not form more than 15 per cent. of the ration. Beans are not very palatable to pigs of any age.

Rice.

Rice, if fed in excessive quantity, will produce flesh inclined to be soft. Because of the large percentage of husk, rice should not exceed 25 to 30 per cent. of any ration.

Canary Seed.

An analysis of this grain indicates that the fat and protein contents are greater than for most other grains. However, the additional protein is not so great that it would materially reduce the protein supplements necessary to balance the ration.

With a high fat content, excessive feeding of canary seed would tend to produce a soft fat and for this reason it is recommended that it constitutes not more than 50 per cent. of the grain ration.

Arrowroot.

Arrowroot is a useful crop, heavy yielding, hardy, and will stand in the field for long periods before it need be harvested. Although most of the nutriment is in the bulbs, pigs will eat the tops, which are usually succulent. Arrowroot may be fed raw or boiled, or the pigs may be allowed to harvest the crop themselves. This feed is a carbonaceous roughage and should be fed in combination with more concentrated and protein-rich foods.

Potatoes.

Potatoes consist of about 75 per cent. water and 25 per cent. dry matter, which for the most part is composed of starch. In view of this large quantity of water, 4 lb. of potatoes are generally accepted as being equal to 1 lb. of maize or wheat. This raises the question of bulk. While potatoes may be fed to all classes of pigs, best results will be obtained when pigs are 16 to 18 weeks old, at which stage the digestive tract will have grown sufficiently to cope with the necessary bulk, and one-third of the grain ration may be replaced by potatoes. As pigs

become older the proportion may be increased. Thus, by the time pigs are about 23 weeks old, two-thirds to three-quarters of the ration could be replaced, but it would not be advisable to go beyond this point.

Usually potatoes are too valuable to be used as pig feed, but when they are available they should be boiled.

Sweet Potatoes.

Sweet potatoes are a bulky carbonaceous food which may be used to replace portion of the grain ration; about 4 lb. of sweet potatoes are considered equal to 1 lb. of grain. Pigs of all ages relish sweet potatoes, and they may be dug and fed in the yards, or pigs may be turned on to the crop and allowed to do the harvesting themselves. The vines make good green feed, but there have been cases of poisoning; this risk, however, is very slight when compared with the large number of pigs which are fed on this crop. When pigs are fed on sweet potatoes, protein-rich foods, such as separated milk or meatmeal, should be included in the ration.

Peanuts.

Peanuts may be fed to pigs of all ages, but because of their very high oil content (about 36 per cent. will produce soft or oily bacon, and therefore should be eliminated from the ration at least six weeks before the pigs are ready for market.

Soybeans.

Soybeans also are excellent food for young pigs, but should be used in the same way as peanuts. The high oil content of the soybean (about 17 per cent.) will produce soft pork or bacon.

Molasses.

Molasses contains approximately 57 per cent. of carbohydrates in the form of sugar, and is therefore a heat and energy producing food. It has a laxative effect on pigs, and is useful in dry seasons when green feed is not available or in short supply. Molasses should be fed in only small quantities, as careless feeding may cause severe diarrhoea.

Cassava.

The root of cassava has a similar analysis to sweet potatoes. However, care must be taken unless the variety intended for feeding is known to be safe, because several varieties contain a prussic-acid yielding glucoside. Overseas feeding tests have shown that when cassava constitutes one-half of the ration severe scours result, but if only forming one-third of the ration good results are obtained.

Cassava has a value as a "stand-over" or reserve crop.

Mangolds.

These are a bulky carbonaceous food containing approximately 85 per cent. of water. They may be fed to all classes of pigs, best results being secured when pigs are 16 to 18 weeks of age, at which time up to one-third of the grain ration may be replaced by mangolds.

While there have been no reported cases of loss when feeding mangolds fresh, it is a good practice to store or allow to wilt for one or two days in a cool place before feeding. Reports have been received of poisoning when mangolds have been cooked.

Sugarcane and Cow Cane.

These feeds contain large amounts of fibre not digested by pigs, and are of low food value, but during dry periods or when green feed is not available they may serve a useful purpose. Plenty of cane should always be fed, otherwise constipation may result from pigs feeding on the fibre.

Pollard.

Pollard is a valuable addition to grain foods, helping very considerably in balancing the ration, and its fineness makes it very suitable for young pigs. When fed alone, it has a tendency to produce soft flesh. The best results are obtained when it is used as a supplement to grain foods.

Bran.

Bran, when fed wet, has a laxative action, so is useful in preventing constipation in sows. It is usually given just before or after farrowing. It is not recommended as a fattening food.

Meatmeal.

Meatmeal, a protein-rich food, is a meatworks by-product, and is very valuable in balancing grain rations when milk or milk by-products are unavailable.

Blood Meal.

Blood meal is a protein concentrate containing 60–75 per cent. protein. Its palatability varies, but if mixed with other supplements it gives good results.

Fish Meal.

As a protein supplement, fish meal is equal to meatmeal, but if fed in excessive quantities may give a fishy flavour to the carcase.

Linseed Meal.

Linseed meal should form only 6 per cent. of a ration. It is a protein-rich food, has a fairly high oil content and exerts a laxative action.

Cottonseed Meal.

Cottonseed meal, a by-product, is a protein supplement. Its use has been limited because some cases of poisoning have been reported when fed in too large a proportion or over lengthy periods. Recent experiments, however, have indicated that up to half the protein supplement of a ration may consist of cottonseed meal.

Cocoa Meal.

Cocoa meal cannot be recommended as a food for pigs, and has been known to cause abortion in sows.

Peanut Meal.

Peanut meal is a source of protein supply which gives good results, but it is preferably mixed with equal parts of meatmeal, the mixture being fed at the same rate as recommended for meatmeal. Peanut meal should not be fed in excess, because the bacon produced may be soft and have a distinct flavour.

Pumpkins.

Pumpkins contain over 80 per cent. of water and are therefore a bulky food, but they are palatable to pigs and best fed raw.

The seeds of pumpkins contain a fair amount of oil and protein and also act as a mild worm killer. For these reasons they should not be wasted; but they should be fed with caution, as digestive troubles sometimes occur when excessive amounts of seeds are fed without the flesh of the pumpkin.

Pumpkins can be ready for feeding in good seasons from December onwards, and if stored in a dry, cool place and picked over frequently to remove the rotting ones the pumpkin supply may be kept up till the following summer.

Pigs relish pumpkins and the crop fits into the cropping system very well. Pumpkins are useful when fed in combination with grain, milk and lucerne. Cases of yellow colouration in the flesh of pigs fed heavily on pumpkins have been reported; therefore, care should be taken not to overdo pumpkin feeding with porkers or baconers.

Melons.

Melons are sometimes used as pig food, but contain approximately 95 per cent. of water. They are therefore not so nutritious as pumpkins.

Candlenut.

Refined oil from the candlenut has been used as a substitute for linseed oil, but as in the case of raw oil it causes severe scouring when included in the ration fed to pigs. The residue after extraction is known to contain poison and when fed to brood sows may cause abortion due to severe pain associated with the scouring. Candlenut meal or oil is not recommended as pig food.

Skim Milk and Buttermilk.

In supplementary value, skim milk and buttermilk excel any other single feed. They are especially recommended for pigs just weaned, as they are very palatable and digestible. They usually contain between 3 and 4 per cent. protein, and supplement well the proteins of farm grains. Skim milk and buttermilk also are rich in essential mineral elements.

While these feeding stuffs are of equal value for pigs, precautions should be taken to see that the buttermilk has not been diluted with wash water. Both should be pasteurized or boiled in order to prevent the possibility of tuberculosis. Their high value is shown by the fact that roughly 200 lb. can be considered worth as much as a bushel of maize.

When these by-products are fed in small amounts they have a higher value per pound than when they form a large proportion of the ration. Young pigs require larger proportions of milk to grain than do older pigs. It will be found that about one gallon of skim milk or buttermilk per day will balance a maize ration for pigs from weaning age to market weights. During the period of rapid growth (between 90 and 130 lb.), 1½ to 1¾ gallons may be utilized very profitably.

Whey.

Whey has a value of approximately half that of skim milk or buttermilk.

Relative Value of Feeding Stuffs.

One pound of grain (barley, wheat, maize or sorghum) is approximately equal to—

4 lb. sweet potatoes.
4 lb. English potatoes (boiled) or artichokes
5 lb. arrowroot.
6-8 lb. pumpkins or apples.
8-9 lb. mangolds, turnips, or carrots.
5-10 lb. green pasture or forage crops
10 lb. separated milk or buttermilk.
9-15 lb. kale, kohl rabi, cabbage, cauliflower or melons.

Plate 101.
A Paddock of Kikuyu Grass Providing Excellent Grazing for Pigs.

GRAZING.

There is nothing which will solve as many of the problems of pork and bacon production as an abundance of good forage.

Pastures, when green and growing rapidly, are one of the best and cheapest kinds of food for pigs. They provide nutrients needed to balance grain feeds at a lower cost than supplements can be purchased, and pigs make more rapid gains when allowed the run of good pastures. More sanitary conditions are to be found where grazing is practised, as well as a reduction in losses from disease. The best foundation for economical production of pork is the maximum use of good quality forage crops and pasture.

One of the advantages of a good mixed grass and clover pasture is the large amount and high quality of the protein supplied. Protein compounds vary as much in quality as a champion boar of to-day differs from the "Captain Cooker" or "Razor-back" of yesterday. All grains

are deficient in some of the essential nitrogen compounds called amino-acids. Pasture crops are rich in the substances needed to make a balanced protein supply, and for this reason pastures have more value than simply saving grain.

The vitamin requirement of pigs is becoming better understood and, while there is always a tendency to over-emphasise a new theory, it is realised now that a lack of certain vitamins limits the growth of pigs. Pasture crops are rich in vitamin A. Vitamin D is not abundant in green feeds, but when pigs are grazing they are exposed to the sun's rays, certain of which ensure the requirements of this vitamin. Other vitamins are not so likely to be lacking in rations fed to pigs as A and D, and the more varied rations when pigs are on pasture help to assure an adequate supply.

Plate 102.

PIGS GRAZING ON LUCERNE. CAREFUL MANAGEMENT OF THIS VALUABLE CROP IS IMPORTANT.

Minerals are needed by growing pigs; the most common shortages are in calcium and phosphorus. Grains are low in calcium but, where milk by-products are fed, this shortage is supplied to some extent. Legumes in pastures and rape are rich in calcium. While pastures are very valuable feeds, pigs cannot grow profitably on pasture only. There is too much water in proportion to dry matter in young grass, and in the more mature stages grasses have too much fibre.

To Summarise:—

Grazing admits an animal to the healthy influence of sunlight and stimulates exercise.

Grazing stimulates the digestive processes and largely assists towards maximum gains in weight.

Grazing provides protein and mineral ash, essential elements in pork and bacon production.

Grazing effects a saving when compared with sty feeding.

Grazing saves labour.

GREEN CROPS.

When soil and climatic conditions are suitable, lucerne is easily the best green crop for pigs. Careful management of this very valuable crop is important, and it is suggested that pigs be allowed to graze on only portion of the lucerne paddock, and not remain long enough to do damage before being removed to a fresh section. Under some conditions, it may be found more economical to cut and feed the lucerne than to graze it.

The following table shows a number of crops recommended as being suitable for pigs. Further information will be published as "Crop Planting Tables" in this Journal at an early date.

SUITABLE CROPS TO GROW FOR PIGS.

Name of Crop.	When to Sow.	When Available.
Lucerne	April to May	
Barley	March to June	May to September
Rye	March to June	June to September
Oats	April to June	July to September
Rape	March to May	June to August
Cowpea	September to January	January to May
Pumpkin	August to January	January to June
Maize	August to January	December to May
Millet	September to January	November to March
Sorghum	August to February	December to June
Arrowroot	August to October	April to June
Artichoke	August to October	December to February
Sweet Potatoes	August to January	November to April
Mangolds	February to April	August to October

MINERALS.

Pigs originally obtained their nutriment from natural pastures. Every necessary chemical requirement to produce perfect results was supplied; thus intestinal disorders were almost unknown to animals grazing at will on virgin pastures. To-day, we have these same pigs with much the same constitutions requiring the same balanced nourishment they required in their wild state. We confine them to limited areas and feed them on dry grains and other foodstuffs; consequently some ingredients found in natural pastures are lacking and should be supplied by other means.

Of all farm animals, pigs grow the most rapidly. No other domestic animal shows so quickly the result of mineral deficiency. The rapid development up to 180 or 200 lb. liveweight at 6 or 7 months of age calls for much bone-building material in the food. In addition, sows produce two litters a year, making their demands for minerals very heavy.

Dairy by-products supply a large amount of minerals, but even when these are being fed it is well to provide some additional minerals, and one of the following simple mixtures will be found to meet the general requirements:—

No. 1—Equal parts by weight of—
Ground limestone or air-slaked lime.
Sterilized bone meal.
Salt (fine).

No. 2—Equal parts by weight of—
Wood ashes.
Sterilized bone meal.
Salt (fine).

No. 3—To No. 1 and No. 2 mixture add ⅛ by weight of meatmeal to increase palatability.

No. 4—Mix—
25 lb. ground limestone.
30 lb. fine salt.
15 lb. sulphur.
5 lb. copperas.
1 lb. copper sulphate.

No. 5—Mix—
25 lb. ground limestone.
25 lb. sterilised bone meal.
30 lb. fine salt.
15 lb. sulphur.
5 lb. copperas.
1 oz. potassium iodide.

One of these mixtures should be placed in a small trough protected from the weather to which pigs have access at all times. On the other hand, when dry feeding is practised, 1½ per cent. of ground limestone and 1 per cent. of fine salt may be mixed with the ration or 2 per cent. of one of the above mixtures.

GARBAGE.

The quality of garbage or kitchen refuse varies greatly, and it is very difficult to make any recommendation for supplementary feeds. If garbage consists mostly of bread scraps, some protein concentrate should be added; on the other hand, if large quantities of meat scraps are present, grain or pollard may be included to obtain greater value from the garbage.

Care should be taken to see that no foreign matter such as cloth, paper, glass, nails, &c., is included. There is always a certain amount of risk in garbage feeding, as poisonous and injurious substances may be in the garbage tins and cause the death of animals. Persons feeding garbage are required by law to fulfil certain conditions, details of which may be obtained from the local Town or Shire Council. Garbage should be thoroughly boiled before feeding, otherwise there is considerable risk of disease, such as swine fever, which is carried in meat scraps.

FEEDING THE BOAR.

Generally, boars intended for breeding will maintain their condition on 2 lb. to 4 lb. of grain mixture per day. However, some may be maintained largely on green feed or root crops, with a grain ration of only 1 lb. per day, while others may require up to 5 or 6 lb. daily.

For maximum fertility, it is important that the ration should contain plenty of green feed. It is equally important that a boar

should not be overworked, especially a young animal, say nine months old, and while he is still growing rapidly. In the case of a mature animal, a good general rule would be to provide one boar to every 20-25 sows, but for a young boar just commencing stud work he should not be allowed more than one service a fortnight; also, special attention should be given to the feeding of young boars, and the grain ration should be larger than for the average adult animal, and may be increased to 5 or 6 lb. daily.

Plate 103.

DIRTY YARDS SUCH AS THE ONE ILLUSTRATED ARE A PROLIFIC SOURCE OF DISEASE INFECTION.

As a general rule, the boar's condition is the best guide as to efficiency of management and feeding. He should be kept in good breeding condition, and not too fat. Over-condition will make the boar lazy, clumsy and impotent, and should be avoided.

FEEDING THE BROOD SOW.

Strong, healthy pigs are what every farmer wants when the sow farrows, and to ensure such pigs, careful feeding and handling of the sow before farrowing are necessary.

The brood sow needs food for three important purposes: first, for her own maintenance; second, for growth of her own body; and third, for the nourishment of the unborn litter. Maize, wheat and barley are too concentrated and lack bone-formers. Skim milk and buttermilk, meatmeal, pollard and grazing (clover, lucerne, kikuyu grass, &c.) are the logical supplements to grain. When available, root crops (sweet potatoes, arrowroot, &c.) are suitable substitutes.

In the early stages of gestation the sow may require little more than good grazing or root crops with approximately 1 gallon of separated milk a day, and clean drinking water available at all times.

However, 5 to 6 weeks before the farrowing date the sow should be separated from the herd and placed in the springer paddock. About 1 to 1½ lb. of grain should then be fed, and this may be increased to approximately 2½ lb. a day with 1½ to 2 gallons of separated milk or ½ to 1 lb. of meatmeal. Consideration, however, should be given to the sow's condition; she should not be permitted to become overfat, as the effect on the litter may be serious. In many cases, such sows have small litters, often overlay a number of pigs, and the milk flow is poor. On the other hand, stronger, healthier litters are usually the result of careful feeding and thought during this period. Above all things, excepting the food supply, is an abundance of exercise. All classes of pregnant animals do well only when opportunity for ample exercise is allowed. The general tone and vigour of the mother is reflected in the offspring—the better the general health and condition of the dam, the stronger and more vigorous the young.

Free range on good pasture is best, and maize may be scattered on the ground well away from the shelter shed or sleeping quarters. When lucerne is fed, feeding racks are useful, as they are conducive to light exercise. If, however, sows are inclined to lie around, exercise should be forced. Such effort will be repaid by increased health and vigour of the litters.

Warmth, dryness, ventilation and sunlight are essentials of the ideal pig shed and run, and such conditions may be assured with little expense and thought. Good dry bedding in winter is needed, and to be kept dry should be changed regularly. The sheds should be arranged so as to avoid draughts and prevailing winds, and should usually face north or north-east. Attention to these points will be amply rewarded.

The sows should be kept free from lice by the application of oil (6 parts of sump oil to 1 part kerosene) at frequent intervals, and the bowels kept laxative, as costiveness is detrimental to both sow and expectant litter.

The essentials of brood sow management may be summarized as:—

Provide suitable food, but do not overfeed.

See that sows have plenty of exercise.

Provide warm, dry, well ventilated sheds.

Kill all lice.

Avoid constipation by natural feeding, but administer medicine if necessary.

Practise gentleness with the brood sow, remembering that good treatment promotes contentment with corresponding profits.

FEEDING SOW AND LITTER TO WEANING.

About 10 days before farrowing, the sow should be placed in the farrowing pen, with access to an exercise yard, in order that she may become accustomed to the new surroundings. A careful watch should be kept to see that her bowels are laxative; if costive, 3 oz. of castor oil in bran mash (1½ gallons separated milk and 1 lb. bran) should be given. No food should be given for some time after farrowing, but clean drinking water should always be available. After about 12 hours, 3 oz. of castor oil in bran mash may be given. This will put the sow in good condition for the job of rearing the litter until eight weeks old.

Careful feeding at this stage is necessary. The ration should be light, consisting of approximately 2 to 2½ lb. cracked grain, and 2 to 2½ gallons of separated milk or 1 to 1¼ lb. of meatmeal. At about six to seven days after farrowing the ration should be gradually increased, taking approximately one week to bring the quantity up to full brood sow ration of 6 to 7 lb. of cracked grain, and 2 to 2½ gallons separated milk or 1 to 1¼ lb. of meatmeal, given in two feeds. These quantities should be accepted as a guide only, as no hard and fast rule can be laid down, each case being judged according to the sow's appetite and size of litter. In addition, plenty of clean drinking water should be always available. This does not apply only to the sow, because whatever their class, pigs do not make maximum gains even with the best of food, unless they have drinking water at all times.

Approximate Water Requirements of Pigs.

Liveweight of Pigs.	Approximate Daily Water Requirement.
30 lb.	½ gal.
65 lb.	¾ gal.
100 lb.	1 gal.
200 lb.	1¼ gal.

Suckers.

For some weeks after birth, suckers will do best on sow's milk as a sole diet, and it is therefore important that sufficient supply of this natural and best of all foods should be forthcoming. In the third week suckers should be encouraged to eat supplementary foods, which should be provided in a small trough behind a creep away from the mother. A little cracked grain or cracked grain and pollard, to which is added meatmeal, will not cause digestive troubles and will provide the requirements necessary for rapid growth.

Young pigs require plenty of direct sunlight and exercise, and should be kept in clean yards or allowed the run of good grass paddocks. Scouring and digestive troubles are caused by feeding from dirty troughs, by eating stale food, or by dirty, damp conditions.

Suggested rations to be fed in the creep are:—When the suckers are four weeks of age a little cracked grain may be given; when five weeks old each should be allowed approximately ¼ lb. cracked grain and ⅛ lb. meatmeal per day, after which the cracked grain may be increased by ¼ lb. per week per pig and the meatmeal gradually increased to ¼ lb. per day by the time the pigs reach eight weeks of age or weaning time.

Suitable Mixtures for Creep Feeding.

No. 1.—

Cracked grain (maize, wheat, sorghum)	50 lb.
Pollard	35 lb.
Meatmeal	10 lb.
Linseed meal	5 lb.

No. 2.—If pollard is not available—

Cracked grain (maize, wheat, sorghum)	50 lb.
Meatmeal	15 lb.
Linseed meal	5 lb.

No. 3.—If pollard and linseed meal are not available—

Cracked grain (maize, wheat, sorghum)	50 lb.
Meatmeal	17 lb.

Plate 104.

Untidy, Littered Pig Yards Such as This Should not be Tolerated.

WEANING.

One of the principal jobs in pig management is weaning suckers from the sows. The system of weaning followed should include the welfare of both the sow and the suckers. If a sow is a heavy milker, the sudden weaning of her pigs will be apt to result in some of the teats being damaged, but proper handling should reduce this risk. For two or three days before weaning, the sow's food should be reduced. This will assist the drying up of the milk flow; then for two or three days after the sow has been taken away she should be turned in with the suckers for one or two hours each day. If this system is adopted, no trouble should be experienced with the sow's udder.

Weaning time is a critical period in the growth of young pigs. Unless the process is carried out gradually and, as previously mentioned, the young pigs taught to eat solid food while still suckling, growth is always retarded. Also, if weaners are placed in strange surroundings they worry and run along the fences. Other trials such as castration

and sudden changes of food should not be allowed at weaning time. The best time for changes or operations is before weaning, while the suckers still have the benefit of the mother's milk.

Research workers point out that retarded growth at this period has an adverse effect on the quality of the muscular tissue laid down by the pig, and that the incomplete development of the "eye" of meat in the loin is due to a setback at weaning.

Plate 105.
Disease Lurks in Unclean Yards.

Weight of the litter at weaning time is of great importance, and such weights can be taken with very little trouble. A very good use of these litter weights is to compare the production of different sows in a herd. In every herd it is found that certain lines of blood are much more valuable than others. Some pigs grow faster, mature earlier, and are ready for market more quickly. Instead of making selections by observation of the growthiness of litters, actual weights will give considerably greater accuracy. Using litter weights, in addition to other reasons for culling, will build up the standard of the herd rapidly.

This system of culling is reasonably accurate, because, in many cases where both the weights of pigs and amounts of feed eaten by each pig are studied, it is found that in 80 out of every 100 pigs those making the heaviest weights for age make the most economical gains.

SUITABLE RATIONS FOR YOUNG PIGS.

Rations tried and found suitable for pigs from weaning age to porkers or baconers are given in the following table, which shows the quantities to be fed each day. It is not intended that these rations should be strictly adhered to, but that they should serve more as a guide to the farmer when determining the most suitable ration to feed under his particular conditions. The practical interpretation of the

table, when maize, skim milk and green feed are available, would be, for 30 lb. live weight pig (weaner), 1 lb. of maize and ½ to 1 gallon of separated milk per day, with good grazing or green feed at midday, the maize and milk to be fed half in the morning and half at night.

The quantity of milk should be kept constant from weaning age to pork or bacon weights, but the maize should be increased ¼ lb. per week per pig, to a maximum of 6 lb.

Should separated milk or buttermilk not be available, some other protein supplement, such as meatmeal or suitable proprietary products, should be used.

Suggested Daily Ration for Pigs.

Live-weight of Pig.	Grain (Wheat, Maize, Barley, Sorghum Seed).	Separated Milk or Buttermilk.	Meatmeal (when Milk By-products are not available.)	Green Feed, if Hand-fed (Lucerne, Barley, Rape, &c.).
Lb.	Lb.	Lb.	Lb.	Lb.
30	1	5	¼	¾ to 1
50	2	7·5	½	¾ to 1
65	2½	7·5	½	¾ to 1
80	3	7·5	½	1 to 1½
100	3½	5	¼	1 to 1½
120	4	5	¼	1 to 1½
135	4½	5	¼	1 to 1½
150	5	5	¼	1½ to 2
165	5½	5	¼	1½ to 2
180	6	5	¼	1½ to 2
200	6	5	¼	1½ to 2

Substitute for Milk.

The chief foods which will be found available in the drier areas of the State are wheat, barley and grain sorghums, but feeding trials have demonstrated that cereal grains alone are uneconomical and should be supplemented. On the coast milk or milk by-products are used, but where dairying is not practised some other protein-rich food should be found as a supplement to grain.

It is generally known that meatmeal is a good substitute for separated milk in the pigs' ration, but it should be used carefully and in correct proportions, otherwise it may prove expensive.

Pigs thrive on small quantities of milk when fed in combination with grains or other foods, and milk supplies the protein necessary to balance the ration. Each pig from weaning age to bacon weight, and dry sows, should receive a minimum of ½ gallon per day. Sows with litters require at least 1½ gallons per day to balance the ration; larger quantities may be used to advantage. However, when these minimum quantities of milk are not available, meatmeal may be substituted, using ¼ lb. of 60 per cent. meatmeal to replace each ½ gallon of separated milk. However, the quantity used should not exceed ¼ to ½ lb. per pig per day from weaning age to baconer weight, with ¼ lb. per day for dry sows, and 1¼ lb. daily for sows and litters.

In cases where pigs have access to good grazing or green crops, the quantity of meatmeal may be reduced by up to 50 per cent., depending on the quality of the green food available.

Meatmeal may be mixed with water, fed dry, or mixed in correct proportions with a meal.

Suggested Ration for Growing Stock.

Crushed grain (wheat, barley, maize or sorghum)	80 lb.
Meatmeal (60 per cent.)	9 lb.
Good lucerne or oaten chaff	9 lb.
Fine salt	1 lb.
Ground limestone	1 lb.
	100 lb.

Feeding.

Self-feed or allow each pig when eight weeks of age 1½ lb. per day, given in two feeds, and increase the meal ¼ lb. per week per pig. Clean drinking water and ample grazing area should always be available.

Self Feeding.

The progressive pig raiser is continually on the lookout for equipment which tends toward making for more efficient management; in this regard there is nothing that can lessen the labour costs and make his lot an easier one to the same extent as the installation of self-feeders.

The self-feeder is designed primarily to keep a supply of grain or grain mixture constantly before the pigs and at the same time protect the contents from the weather. Plans and specifications are given in a departmental pamphlet, "Pig Farm Accommodation."

The self-feeder consists of a bin or hopper, to hold the bulk supply of food, and a feed trough below, which is automatically replenished from the bin as the pigs use up the feed. It is necessary to build the self-feeder large enough to hold enough feed for several days. It should be remembered, however, that when the self-feeder is filled it is not a matter of simply leaving it until it is empty; a constant watch should be kept on the flow of food into the trough. In wet weather the food is liable to clog, and together with the mud carried on the pigs' snouts and feet, may choke the outlet; also, the feed may become soiled, making it unpalatable to the pigs. These troubles can be eliminated by daily inspections.

A noticeable feature about pigs that are accustomed to self-feeders is that there is no over-crowding, and only a small quantity of food is consumed at any one time; it is eaten slowly, thoroughly masticated, and there is little or no waste; neither is there any risk of over-eating or serious digestive trouble. It is always advisable to have good pastures for the pigs during the time they are on the self-feeder, and it is important that a permanent supply of clean drinking water is available.

Farmers feeding dairy by-products will have less need to feed mixtures containing protein meals such as meatmeal, &c., as separated milk is very suitable to balance grains such as wheat, maize, and sorghum seed. Dairy by-products should not be self-fed, as they spoil if more is given than the pigs will clean up at one feeding. The practice should be to self-feed the grain, and hand-feed twice daily enough separated milk to balance the ration.

MARKETING

CURRENT FEEDING VALUES FOR MONTH OF OCTOBER, 1948.

(Division of Animal Industry and Division of Marketing).

Feed.	Starch Equivalent Value per 100 lb.	Digestible Crude Protein Value per 100 lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks.
				d.	
STARCH CONCENTRATES.					
Wheat	72	8	7s. 7d. bushel (ton lots)	2·11	Plentiful
			7s. 9d. bushel (less ton lots)	2·15	
Wheat Meal ..	72	8	£14 3s. 4d. short ton (2,000 lb.)	2·44	
Maize	78	8	11s. 6d. bushel	2·55	Scarce
Maize Meal ..	71	8	£23 short ton (2,000 lb.)	3·88	
Sorghum	71	7	None available	..	Scarce
Sorghum Meal ..	71	7			
Barley	71	7		..	Scarce
Barley Meal ..	71	7	Not quoted		
Oats	62	8	6s. bushel (ton lots)		
			6s. 2d. bushel (less ton lots)	2·9-3·06	Plentiful
Crushed Oats ..	62	8	6s. 2d. bushel (ton lots)		
			6s. 4d. bushel (less ton lots)	3·06	
Pollard	66	10	Not quoted	..	Bran and pollard in limited supply
Bran	56	10			
Molasses ..	50	..	47s. 6d. per 44 gallons	2·59	
PROTEIN CONCENTRATES.					
Meatmeal ..	80	55	Not quoted		
Linseed Meal ..	72	25			
Peanut Meal ..	78	43			
Blood Meal ..	63	68			
Cottonseed Meal	67	33			
Meat and Bone Meal	68	46			
ROUGHAGES.					
Lucerne Hay and Chaff	35	15	Hay £10 10s.	3·21	Market very strong for chaff and hay
			Chaff £13 10s.	4·13	
Oaten Hay ..	35	3	£7 10s. ton	2·29	
Wheaten Hay ..	35	3	Not wanted		
Oaten Chaff ..	35	3	£10 10s.	3·21	
Wheaten Chaff ..	35	3	£9 15s.	2·98	
MINERAL SUPPLEMENTS					
Ground calcium carbonate (limestone)			None quoted		
Bone Meal					
Bone Flour					
Shell Grit					

Production Trends—October.

Less than average rains were received during October. Dust has been prevalent, and fire risk has increased in all dry areas. Rains are urgently required in all districts except the Darling Downs, where wheat harvesting has commenced.

Harvesting of potatoes has commenced. Wilt and tuber moth have reduced yield prospects in some areas. South Queensland production is estimated at 14,000 tons.

Dairy cattle are mostly holding condition. In a few districts cattle have been moved to agistment. Milk and cream production was increasing at the beginning of October, but declined towards the end of the month.

Sugar cane is cutting well up to estimate, and it is now expected that 6,350,000 tons of cane will be crushed, with a consequent estimated production of 882,000 tons of sugar.

The condition of sheep on the Darling Downs and in the Maranoa and Warrego districts is good, but elsewhere condition has fallen off, with mounting stock losses in the Central and North-west districts.

Brisbane Wholesale Markets—October.

October saw big changes in the prices of peas and beans. Opening at top prices of 6d. and 4d. respectively, they advanced until they were both 1s. 3d. per lb. at the close of the month. Cabbages were practically in glut supply throughout the month. Although quality was of a very high standard, only on the last two days of the month were any sales recorded over 4s. per dozen. Growers marketing tomatoes experienced extremely good prices which ranged to as high as 30s. per half bushel case. The continued scarcity of all root crops resulted in prices remaining at exceptionally high levels.

A continuous decline in the supply of pineapples occurred during the month and for the last two weeks 22s. to 24s. per tropical case was general for best counts. On the other hand, a considerable increase in consignments of papaws, particularly from local sources, occurred, and only special packs made over 8s. per bushel case. The market for bananas remained steady at up to 34s. per tropical case for Cavendish, although during the last week of October there was a noticeable seasonal increase in supplies.

The protracted spell of dry weather throughout many of the northern and western centres of Queensland resulted in a very keen demand for all types of fodder and particularly lucerne chaff and lucerne hay, best quality lots bringing to £16 10s. and £12 10s. per ton respectively. Considerable quantities of new season's onions were on offer. A very keen demand existed for the small percentage of choice onions, but the large majority, which were of medium to poor quality only, were slow of sale at comparatively low rates. The limited quantities of yellow maize received sold at the high prices of 10s. per bushel at opening, increasing to 11s. 6d. per bushel towards the end of the month.

European Recovery.

Apart from coarse grains, where the acreage was slightly larger than during the pre-war period, the acreage devoted to the main agricultural crops in Western Europe for 1946-47 was 8 per cent. lower than before the war. Except for sugar, production of these crops, and livestock population, were fully 10 per cent. below those of the pre-war period. This is stated in an article in the "Economist" of 16th October, 1948.

Most western European governments have embarked on long-term agricultural development schemes, under which, by 1950-51, the area devoted to grain crops and the numbers of livestock are expected to regain, and the area under sugar beet and the numbers of poultry to exceed, their prewar level. One of the main objectives will be the expansion of milk production to slightly above the prewar level. Recovery in meat production is expected to be less marked, and will still be 12 per cent. below the 1934-38 average. During this period, the population of western Europe is expected to increase by 11 per cent.

These plans, which form the basis of the Europeon Recovery Programme, are dependent for their fulfilment on certain assumptions. In the first place, they presuppose an adequate supply of agricultural raw materials—fertilizers, equipment, feeding stuffs, insecticides and seeds. Secondly, they presume the maintenance of East-West trade in Europe. Thirdly, they envisage development of agricultural production in colonial areas.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE RIGHT WAY TO BATHE YOUR BABY.

ANY routine procedures in baby care can be the origin of quite serious accidents if not properly carried out. One of these is baby's bath. A mother with a first baby should be taught how to bathe him by her nurse or other experienced person before she undertakes it herself.

Even if she has helped to bathe little brothers or sisters it is advisable for her to check her technique now that she is solely responsible. In these days of small families it is quite usual to find mothers who have never even nursed a baby till their own came along, much less bathed one.

Time to give the Bath.

Baby is usually bathed once a day, although in a hot climate like we have in Queensland two baths a day are often necessary to keep baby cool and comfortable. It is better to give the bath about the same time each day and a convenient time for most mothers is before the 9 or 10 o'clock morning feeding. Baby should not be bathed for at least half an hour *after* a feeding, and in cold weather he should not be taken out of doors for at least an hour after his bath.

Temperature of the Room.

In summer time rooms are usually warm enough (about 75 to 80 degrees) for bathing baby, but on cool wet days in summer and the average winter day some form of artificial heating should be provided, especially for the very young baby. A premature or weak baby requires the room at a temperature of 80 degrees.

Things needed for the Bath.

1. Soap—pure unscented olive oil soap is best.
2. Clean soft towels—at least two—one of which should be large enough to wrap baby in.
3. Soft wash cloths—at least two. These should be washed clean, boiled, and dried daily.
4. Olive oil.
5. A baby's bath tub or large oval bowl.
6. Cotton-wool in a boiled glass jar with screw top.
7. A large bucket or basket for soiled clothing and a bucket for wet and soiled napkins.
8. Bath apron for mother and piece of old blanket and sheet or towel for the bath table.

Preparing the Bath.

Before baby is undressed everything needed for his bath and his complete set of clean clothing should be within easy reach. The tub may stand on the table or on two chairs placed close together.

Mother should wash her hands well and see that her nails are clean, short and smooth. Baby's bath tub should have been scoured and rinsed with hot water. A bath towel placed in the tub, covering the bottom and sides, will prevent baby from slipping and is helpful to an inexperienced mother. Warm water (*never* hot water) should then be put into the tub to a level of 4 to 6 inches. After baby is undressed mother should test the water with her bare elbow and see that it is just nicely warm.

Method of Bathing.

Undress baby, exposing him as little as possible, and wrap him in a bath towel. *Never leave him alone on the table.* No matter how small he is he may roll off.

Dip two small pieces of clean cotton-wool into warm boiled water. Gently wipe baby's eyes, beginning at the corner next to the nose and so outwards towards the temples. Clean the nose with a piece of cotton-wool twisted to a point and moistened with very little boiled water or olive oil. Wet the washer that is to be used for baby's head, wring it out and wash baby's face, using no soap. Dry his face. Soap the washer, wash the scalp and neck and then rinse, holding his head over the edge of the tub. Do not be afraid to wash the "soft spot." Dry the ears carefully, then soap the arms and body all over with the other washer and rinse by lowering baby gently into the tub—feet first—and sponging off the soap. The left forearm should support his head, neck, and shoulders, and the left hand should support his back. Hold his feet with the right hand with one finger between the ankles.

Lift baby gently out of the water and lay him on his stomach on a soft dry towel and cover him warmly.

Dry gently but thoroughly by dabbing with a towel—do not rub hard. Pay special attention to creases in armpits, elbows, groins, &c. If the skin is dried carefully nothing else is needed except a little olive oil round the napkin area.

Dress baby quickly.

Baby's bath should be a pleasant experience, but if he is handled badly, dropped, gets soap in his eyes or is put into water too hot or too cold for him it may start a fear of the bath, and he will be upset and make a fuss each day when bath-time comes round.

If you have any problem in connection with this or other matters connected with children, advice may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters *Baby Clinic, Brisbane.* These letters need not be stamped.

IN THE FARM KITCHEN.

Crispy Crust Rhubarb Pie.

Two pounds rhubarb (sweetening to taste), 1 pint tiny bread cubes (neatly cut from slices of stale bread), 3 tablespoons milk, 2 tablespoons sugar. Stew the rhubarb in a teacup of water and sweeten to taste. Put fruit and juice in a piedish and cover with the diced bread. Pour over the milk, sprinkle with the sugar and bake for 20 to 30 minutes till crisp and brown.

Baked Rhubarb.

Baked rhubarb may be made when the oven is cooking some other food. Butter a covered baking dish, spread a layer of rhubarb over the bottom, sprinkle a layer of sugar, then add another layer of rhubarb, and so on until the dish is filled. Sprinkle sugar over the top, then add small pieces of butter and the grated rind of lemon. Cover the dish and bake slowly until the fruit is tender. Long, slow baking gives rhubarb a rich red colour.

Carrot Pie.

Four large cooked carrots, 1 pint milk, 3 table spoons breadcrumbs, 3 oz. to 4 oz. grated cheese, 1 egg, salt and pepper. Slice the cooked carrots into a greased dish. Boil the milk. Add breadcrumbs, grated cheese, seasoning and well-beaten egg. Pour the mixture over the carrots and bake for ten minutes in a moderate oven.

ASTRONOMICAL DATA FOR QUEENSLAND.

JANUARY.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.56	6.46	Cairns	48	9	Longreach	43	27
6	5.0	6.47	Charleville ..	29	25	Quilpie	33	37
11	5.4	6.47	Cloncurry	63	36	Rockhampton ..	18	2
16	5.8	6.47	Cunnamulla ..	28	31	Roma	19	15
21	5.12	6.46	Dirranbandi ..	16	22	Townsville ..	40	9
26	5.16	6.45	Emerald	27	12	Winton	51	30
31	5.20	6.43	Hughenden ..	48	22	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	6.09	8.30
2	7.08	9.09
3	8.05	9.48
4	9.00	10.13
5	9.53	10.41
6	10.44	11.08
7	11.36	11.36
	p.m.	..
8	12.29	a.m.
9	1.23	12.04
10	2.21	12.36
11	3.22	1.13
12	4.26	1.56
13	5.29	2.47
14	6.30	3.46
15	7.25	4.53
16	8.13	6.03
17	8.55	7.13
18	9.33	8.21
19	10.08	9.28
20	10.41	10.32
21	11.16	11.35
22	11.52	p.m.
23	..	12.38
	a.m.	1.42
24	12.32	2.45
25	1.17	3.47
26	2.07	4.46
27	3.02	5.39
28	3.59	6.26
29	4.58	7.07
30	5.56	8.42
31	6.52	9.14

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	30	11	45	25	20	0	53	28
6	19	19	36	35	10	10	41	40
11	11	27	26	43	1	18	29	51
16	12	28	27	43	2	19	30	52
21	24	15	40	31	15	7	46	35
26	30	9	46	23	21	0	54	26
31	25	14	41	30	10	5	47	34

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	54	6	67	34	51	20	44	7
3	45	14	61	40	46	25	37	14
5	36	24	55	46	40	32	30	21
7	27	34	48	54	33	39	22	29
9	17	38	41	57	26	42	15	33
11	8	48	36	62	21	48	8	40
13	2	55	33	67	17	52	3	45
15	6	53	35	66	20	51	6	44
17	16	45	41	60	26	46	14	37
19	28	33	50	54	34	38	24	29
21	40	21	57	44	42	29	33	18
23	50	10	64	37	48	23	41	10
25	54	3	67	32	51	18	44	4
27	56	3	68	32	52	18	46	4
29	52	8	66	36	50	21	43	8
31	43	18	59	43	44	27	36	17

Phases of the Moon.—First Quarter, 7th January, 9.51 p.m.; Full Moon, 15th January, 7.59 a.m.; Last Quarter, 22nd January, 12.07 a.m.; New Moon, 29th January, 12.42 p.m.

On 15th January the Sun will rise and set 23 degrees south of true east and true west, respectively, and on the 6th and 20th the Moon will rise and set approximately at true east and true west respectively.

On 4h January, at 00 hours the Earth will be at Perihelion—the point in its orbit at which it is nearest the Sun. 91,400,000 miles will then separate these bodies.

Mercury.—At the beginning of the month, in the constellation of Sagittarius, will set 51 minutes after the Sun. On the 8th at 4 a.m. will be in conjunction with Mars and on the 18th at greatest elongation east when it will set about one hour after sunset. On the 28th at 7 a.m. it will again be in conjunction with Mars while on the 31st, in the constellation of Capricornus, it will set only 7 minutes after the Sun.

Venus.—In the constellation of Ophiuchus at the beginning of the month when it will rise between 3 a.m. and 4.15 a.m. About the middle of the month will pass into the constellation of Sagittarius and on the 26th at 6 p.m. will pass about 1 minute to the south of Jupiter which of course will be during our daylight hours.

Mars.—On the 1st in the constellation of Sagittarius, will set about 1 hour after the Sun; while on the 31st, in the constellation of Capricornus, will set 35 minutes after the Sun.

N
E
W
S
New Moon
Full Moon
First Quarter
Last Quarter
Mercury
Venus
Mars
Jupiter
Saturn
CASSIOPEIA
Caph
Schedar
Algenib
Alpheratz
Markab
PEGASUS
Navi
Ruchbah
Segin
Mirach
Almach
ANDROMEDA
Hamal
ARIES
Sheratan
Mesarthim
Alpha Piscium
PISCES
Kaffaljidhma
Eta Piscium
Fomalhaut
GRUS
AQUARIUS
Sadalmelik
Deneb Algedi
CAPRICORNUS
Achernar
PAVO
Peacock
Nunki
Ascella
Kaus Australis
Kaus Media
Kaus Borealis
SAGITTARIUS
Rasalhague
OPHIUCHUS
Cebalrai
Sabik
Yed Prior
Yed Posterior
SERPENS
Unukalhai
Gemma
CORONA BOREALIS
Arcturus
Alphecca
Izar
Rasalgethi
HERCULES
Vega
Sheliak
Sulafat
LYRA
Albireo
CYGNUS
Deneb
Altair
Tarazed
AQUILA
Rotanev
Alshain
Dschubba
Antares
Acrab
Graffias
Fang
Wei
Sargas
Shaula
Lesath
SCORPIO
Zubenelgenubi
Zubeneschamali
Kochab
Pherkad
Polaris
URSA MINOR
Dubhe
Merak
Phecda
Megrez
Alioth
Mizar
BIG DIPPER
Alkaid
URSA MAJOR
Muphrid
Spica
Zaniah
Porrima
Vindemiatrix
Denebola
Algieba
Regulus
LEO
VIRGO
LIBRA
Cor Caroli
Rasalas
Kraz
Alphard
HYDRA
Procyon
Alhena
Pollux
Castor
Menkalinan
GEMINI
CANCER
Betelgeuse
Bellatrix
Mintaka
Alnilam
Alnitak
ORION
Saiph
Rigel
Sirius
Mirzam
CANIS MAJOR
Wezen
Aludra
Adhara
Naos
Suhail
Avior
Miaplacidus
Canopus
Phact
Alphard
Alphecca
Arcturus
Mirak
Cor Caroli
Rasalas
Kraz
Alphard
Procyon
Alhena
Pollux
Castor
Menkalinan
Betelgeuse
Bellatrix
Mintaka
Alnilam
Alnitak
Sirius
Mirzam
Saiph
Rigel
Phact
Canopus
Achernar
Alphard
Regulus
Algieba
Denebola
Spica
Zaniah
Porrima
Vindemiatrix
Rasalhague
Cebalrai
Sabik
Yed Prior
Yed Posterior
Unukalhai
Gemma
Rasalgethi
Sheliak
Sulafat
Vega
Tarazed
Altair
Alshain
Rotanev
Dschubba
Antares
Acrab
Graffias
Fang
Wei
Sargas
Shaula
Lesath
Zubenelgenubi
Zubeneschamali
Kochab
Pherkad
Polaris
Dubhe
Merak
Phecda
Megrez
Alioth
Mizar
Alkaid
Muphrid
Izar

THE WEATHER DURING OCTOBER, 1948.

Many stations in all districts received no rain and the period could be classified as one of the driest Octobers on record throughout the State. In the East Downs, Moreton and Metropolitan areas the percentage of Nil reports was abnormally high and many districts would be in the same category as Brisbane where the rainfall of 3 points was the lowest on record for the period of 97 years for which averages have been computed. Some scattered, light and insufficient storms passed across the North-west, Central Lowlands and Central Highlands on the 11th to the 12th but the Upper West and Central Lowlands areas showed a deficit of 40 per cent. and 70 per cent. respectively. All other districts received from 80 to 100 per cent. below normal rainfall, though the South-east and Central Coast received some storms between the 27th and 30th, mainly in the Central Coast and Port Curtis sections, where only 9 reporting stations registered a little over an inch of rain for the month. Stanthorpe with 105 points was the only other district in the State over 1 inch. The wheat areas received approximately 30 points to half an inch on 1st November but in those areas rain is now required as harvesting of an estimated record twelve-million-bushel crop from 550,000 acres had commenced and was being pushed forward to completion as soon as possible. The dry spell had delayed planting of sorghum and other summer-growing crops but cane harvesting results had been very good in most districts. In the dry to drought areas in the West, Central Interior and Tropical areas of the State over average temperatures were generally accompanied by more than normal dust-storm conditions.

In most dairying and farming areas in the South-east quarter an early soaking rain is needed to offset the dry spell since early in September accompanied by frosts and some drying wind periods.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

OCTOBER.

(*Compiled from Telegraphic Reports.*)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1947.	Oct., 1948.		Oct.	No. of years' records.	Oct., 1947.	Oct., 1948.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·90	42	2·57	0·08	Caboolture	2·73	67	2·68	0·02
Cairns	2·06	61	2·44	0·18	Childers	2·71	48	1·31	0·78
Cardwell	1·95	71	2·73	0·31	Crohamhurst ..	3·38	50	3·20	0·03
Cooktown	1·00	67	0·43	0·00	Esk	2·60	56	2·15	0·00
Herberton	0·93	57	0·81	0·06	Gatton College ..	2·06	44	1·99	0.00
Ingham	1·80	51	0·66	0·00	Gayndah	2·37	72	2·83	0·18
Innisfail	3·12	62	3·24	0·25	Gympie	2·73	73	1·76	0·18
Mossman	2·59	19	2·74	0·34	Kilkivan	2·68	62	1·64	0·00
Townsville	1·25	72	0·11	0·06	Maryborough ..	2·73	72	1·46	0·84
					Nambour	3·23	47	1·94	0·06
Central Coast.					Nanango	2·19	61	3·51	0·00
Ayr	0·87	56	0·11	0·00	Rockhampton ..	1·78	72	0·85	0·35
Bowen	0·97	72	0·24	0·00	Woodford	2·53	55	2·84	0·00
Charters Towers ..	0·71	61	0·19	0·00					
Mackay	1·76	72	0.92	1·12	*Darling Downs.*				
Proserpine	1·53	40	1·10	0·11	Dalby	2·01	73	2·77	0·04
St. Lawrence ..	1·76	72	0·15	0·49	Emu Vale	2·18	47	2·45	0·00
					Jimbour	1·88	64	2·27	0·00
Central Highlands.					Miles	2·00	58	2·85	0·17
Clermont	1·28	72	1·27	0·03	Stanthorpe	2·50	70	4·00	1·05
Springsure	1·62	74	1·85	0·27	Toowoomba	2·54	71	3·17	0·00
					Warwick	2·32	78	3·79	0·14
South Coast.									
Biggenden	2·49	44	2·99	0·00	*Maranoa.*				
Bundaberg	2·07	60	1·22	0·55	Roma	1·73	69	2·27	0·21
Brisbane Bureau ..	2·54	96	3·66	0·03	St. George	1·29	62	3·31	0·40

(Weather and rainfall information supplied by Divisional Meteorologist, Brisbane.)